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The U.S. M-Business Market: Fad or the future

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The U.S. M-Business Market: Fad or the Future

By

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B. Thomas Golisano College
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EXECUTIVE SUMMARY

M-Business is information available on any device, anywhere and at anytime, offering businesses in any industry the potential to expand markets, improve their services and reduce costs. The U.S. m-business market is still in its infancy and is a few years away from becoming a growth market. This is due to a few reasons, which are the lack of standards for connectivity and service, no real applications to support the market and the lack of strong encryption to support m-business and e-commerce. M-business is not a fad but a potential new channel for business operations. This thesis will address the issues of why the U.S. m-business is slow to mature and what is required for the U.S. m-business to become a growth market.

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INTRODUCTION

The maturity of the U.S. M-business market is approximately 2 years from being a viable option for business users to really gain the advantages that wireless and mobile applications have to offer. M-business, if implemented correctly has the potential to drive revenue, make a company more competitive, gain efficiencies in operations and decrease costs of operating the business.

One of the reasons for the slow growth in the U.S. M-business market is the lack of standards for wireless connectivity and the associated mobile service within the United States. There currently exists no real common standard such as in Europe or Japan. This has been one factor that has limited the growth of m-business in the U.S. As an example, the 2.5G and 3G Lite networks will not be implemented until 2002 and a national system is not targeted until 2003.

A second reason is that applications are limited for the m-business market. There are no "killer" applications that would support the growth of the market. There are specific business uses that are available but nothing for the mass market. An analyst with Allied Business Intelligence states that only 15% of Fortune 1000 firms have adopted wireless applications. Location services have been an application that has been tried but based upon initial research they will not be a major application until 2004 and the E911 system is not expected until 2005. One application that has potential is Wireless hot spots that allow handheld and laptop users to connect to the Internet from public places such as airports, libraries, and cafes. Wireless hot spots generated $1.1 million in 2000 with an estimated target of $868 million in 2006.

Currently the carriers do not have the data networks or delivery systems in place to support m-business. There are gaps or "dead zones" in cellular service across the country that need to be addressed to improve the national coverage. There is a need to have billing systems

and models, content management systems and models, and revenue sharing models in place before m-business could be a viable option for businesses. There is also the issue of whether equipment manufacturers can meet the forecasted demand once these systems and models are in place.

Wireless has been marketed not as a business solution but as a technology. Until businesses see the value or the potential of m-business, it will be slow to mature. It depends if there is a business need and if the technology can assist, not the other way around.

Gartner predicts that up to 75% of the 100 or so wireless platform and middleware companies will be gone by the end of 2002, either out-of-business or acquired. The reason is that these vendors need a $3 billion market to survive. This supports the assertion that the market is still young and unstable. The main infrastructure was not in place as of 2001.

The final section of the thesis will focus on the lack of encryption and how it is affecting the growth of the m-business market in regards to e-business. Discussion will focus on how encryption is affecting m-business today and the consequences of security as it pertains to the market. A key point discussed will be how the government is affecting the U.S. m-business market in regards to security, setting standards, developing the infrastructure and providing support. Focus will be given to how the role has changed since the terrorist attacks of Sept.11, 2001.

STANDARDS/TECHNOLOGIES

The lack of common standards in the U.S. mobile market creates challenges and opportunities for service providers, enterprise businesses and users. Many obstacles exist between two mobile devices or people trying to communicate with each other. The different types of networks, operating systems, and different types of mobile devices all respond differently to varying types of data when transmitting and receiving. These obstacles affect the cost implications of any strategy that businesses or service providers must consider in order to address all of the many variables for a mobile solution. The following discusses some of the technologies that are impacting the wireless industry and their impact to the mobile market.

802.11

The IEEE 802.11 standard for wireless local area networks (WLANs) was established in 1997 and can be considered the first important step in the advancement of wireless networking technology. "The standard was developed to maximize interoperability between differing brands of wireless LANs as well as to introduce a variety of performance improvements and benefits. On September 16, 1999, the 802.11 ratified a revision of the 802.11 standard, called 802.11 High Rate, that provides much higher data rates, while maintaining the 802.11 protocol." (Champness)

The 802.11 standard allows for different physical layers (PHY) both of which are radio frequency (RF) based. The choices are Direct Sequence Spread Spectrum (DSSS) or Frequency Hopping Spread Spectrum (FHSS). The difference between the two layers is that the DSSS specifies a peak data rate of 2 Mbps, with an optional 1 Mbps in a noisy environment. The FHSS physical layer operates at 1 Mbps, with an optional 2 Mbps in a clean environment. The majority

of vendors chose the DSSS specification as it allowed an easier transition to the 802.11 high rate standard, which operates at 11 Mbps.

The 802.11b was the first WLAN technology that provided speeds comparable to a wired LAN. Operating at speeds of up to 11 Mbps, early adopting companies utilized WLANs for email messaging, database and Internet access and traditional office networking. According to a report by Cahner's In-Stat, "as early as 1999, more than 50% of the WLAN's being deployed were for traditional office applications versus the proprietary ERP applications used in the logistic and supply chain management industry." (Massaro)

The 802.11b operates in the 2.4GHz band, which is the same as cordless phones and microwave ovens. There is therefore the potential for interference between these devices as all are present in an office environment. An 802.11b WLAN provides access for users up to 400 feet from an access point, but as the user roams farther away, bandwidth decreases. Other concerns with 802.11b besides mobility are security and quality of service, which are being addressed with future improvements and enhancements by the industry. While there are disadvantages, the advantages outweigh them and according to Tiberio Massaro from Signa service, "802.11b is an incredibly viable technology that will remain the standard of choice for another two years." (Massaro)

Both the 802.11b and 802.11a standards were established at the same time. The 802.11b was the first to market due to its simplicity from a development point of view. But the industry is interested in the 802.11a standard as it has higher bandwidth capabilities and transfer speeds of up to 54Mbps. If these speeds are achievable than WLANs could carry streaming video and multimedia applications. A major concern within the industry is that due to the 802.11b and 802.11a being incompatible, there can be no migration strategy on moving from one standard to

the other. This incompatibility leaves companies unsure of their current installs and companies considering WLANs questions of which technology to implement.

The 802.11a standard utilizes Orthogonal Frequency Division Multiplexing (OFDM) while 802.11b uses Direct Sequence Spread Spectrum (DSSS). It is this difference in modulation that allows OFDM to carry up to 5 times more data. (Massaro) While the 802.11b operates in the 2.4GHz band, 802.11a operates in the 5GHz band, which has no interference. But there are issues and concerns with the 802.11a standard as Massaro discusses in his article "Understanding WLAN Standards". The issues are (Massaro):

- The 5GHz band is divided into a lower, middle and upper layer. This means that the standard does not have the entire band available for transmission, and that output is not consistent throughout the band. "This ultimately indicates that range and bandwidth performance will vary drastically from client to client."

- The standard makes it mandatory for clients to adhere to a number of different transmission speeds ranging from 6-54Mbps. As users roam their channels and transmission speeds will fluctuate.

- The 802.11a standard provides for 12 channels for data transmission, which consist of 8 for indoor use and 4 for outdoor use. Due to range limitations, a greater number of access points will be required in order to maintain the desired 54 Mbps transmission speed. This means higher implementation costs, more time to implement, and higher costs of administrating and managing the network.

- At the maximum speed of 54Mbps, range is limited to 20 meters. If speeds are lowered to 12 Mbps, then the coverage is comparable to that of the 802.11b standard. If fewer access points are installed in a network, then coverage is limited and maximum speeds are reduced.

The 802.11a standard has many benefits but needs to be implemented in the right setting where there are no issues with interoperability between other WLANs.

A new standard is being proposed for later in 2002, called 802.11g that will combine the best of both the 802.11b and 802.11a standards. The 802.11g will operate in the 2.4 GHz band and use OFDM allowing it to operate at speeds of up to 54Mbps. It will also be backward

compatible with 802.11b products, including transmission speeds and range capabilities. (Massaro) Expectations are that the 802.11g will be readily adopted due to its interoperability with the 802.11b standard.

GSM vs CDMA

There are two competing standards for cellular data transmission, which are Global System for Mobile communications (GSM) and Code Division Multiple Access (CDMA). The wireless industry is divided into GSM, which is found in much of Western Europe, and CDMA, which is in North America and parts of Asia. Worldwide GSM is the prevailing technology but in the U.S. there is a competition between the two as to which one will be the dominant standard.

CDMA is a relatively new-patented technology only becoming commercially available in the mid-1990's. It's beginnings go back to World War II where inventors had suggested a way for torpedoes to be controlled by sending signals over multiple radio frequencies using random patterns, but it wasn't used as the U.S. Navy thought that it was architecturally unfeasible. The idea was called frequency hopping and has now developed into what is known as frequency-hopping spread spectrum technology (FHSS). It wasn't used until 1962 during the Cuban Missile Crisis by the U.S. military, to secure communications. "CDMA, incorporating spread-spectrum, works by digitizing multiple conversations, attaching a code known only to the sender and receiver, and then dicing the signals into bits and reassembling them." (Sutherland) Coded signals with trillions of possible combinations results in an extremely secure transmission.

Qualcomm patented CDMA, which "enables many simultaneous conversations, rather than the limited stop-and-go transmissions of analog and the previous digital option."

(Sutherland) CDMA was field tested in 1991 and launched commercially in Hong Kong in 1995. Sprint and Verizon are the major carriers that use CDMA technology in the United States.

The advantages of CDMA are (Sutherland):

- Increased cellular communications security.
- Simultaneous conversations
- Increased efficiency, meaning that the carrier can serve more subscribers
- Smaller phones
- Low power requirements and little cell-to-cell coordination needed by operators
- Extended reach – beneficial to rural users situated far from cells

The disadvantages of CDMA are (Sutherland):

- Due to its proprietary nature, all of CDMA's flaws are not known to the engineering community
- CDMA is relatively new, and the network is not as mature as GSM
- CDMA cannot offer international roaming, a large GSM advantage

Around 1993, European carriers and manufacturers made the decision to go with the first digital technology Time Division Multiple Access (TDMA), which is the core technology for GSM. Since most of the wireless users are in Europe and Asia, GSM has taken the worldwide lead as the prevalent technology. Advantages of GSM (Sutherland):

- GSM is already used worldwide with over 450 million subscribers (as of March 2001)
- International roaming permits subscribers to use one phone throughout Western Europe. CDMA will work in Asia, but not France, Germany, the U.K. and other popular European destinations.

- GSM is mature, having started in the mid-80s. This maturity means a more stable network with robust features. CDMA is still building its network.
- GSM's maturity means engineers cut their teeth on the technology, creating an unconscious preference.
- The availability of Subscriber Identity Modules, which are smart cards that provide secure data encryption give GSM m-commerce advantages.

Disadvantages of GSM (Sutherland):

- Lack of access to burgeoning American market.

The disadvantage of access to the American market has lessened as AT&T Wireless has adopted the GSM standard for its network.

The following is a comparison chart for CDMA and GSM:

Figure 1 – Comparison Chart for CDMA and GSM

CDMA	Capacity increases of eight to 10 times that of an AMPS system	Improved call quality, with better and more consistent sound compared to AMPS	Simplified system planning through the use of the same frequency in every sector of every cell	Enhanced privacy	Improved coverage statistics, allowing for the possibility of fewer cell sites	Increased talk time for portables	Bandwidth on demand
GSM	Spectrum efficiency for more network capacity	capacityDigital transmission provides improved voice quality, less interference	Simplified data transmission	Global roaming with one phone	Excellent call security and fraud prevention	Access to data services such as SMS, fax transmission and e-mail	A "living standard" with natural evolution toward 3G

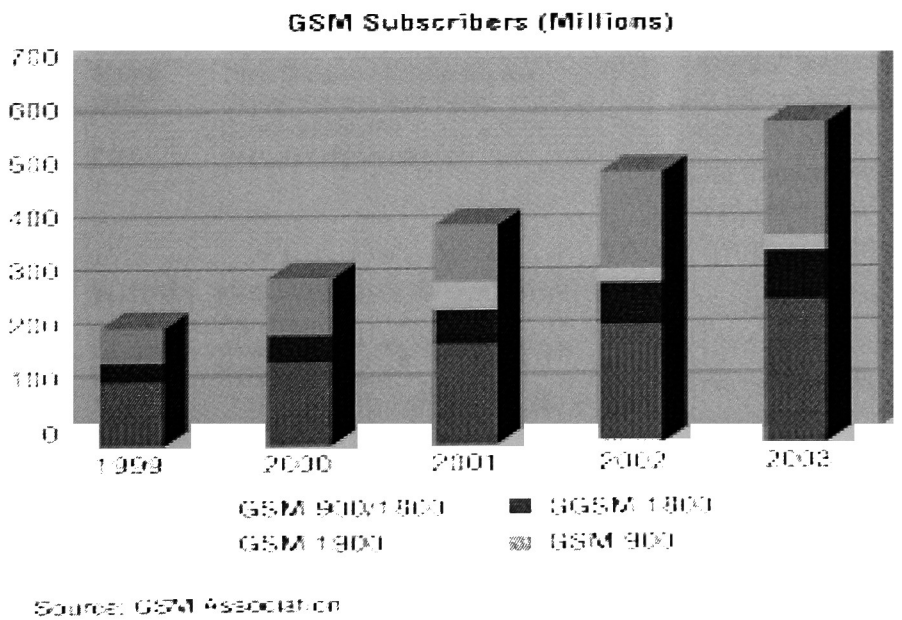
(http://www.telecom.globalsources.com/MAGAZINE/WC/0206/GSMVS03.HTM)

GPRS

The General Packet Radio System is a service that provides packet radio access for Global System for Mobile Communications (GSM) and Time Division Multiple Access (TDMA) users. According to a Cisco white paper on GPRS, "The main benefits of GPRS are that it reserves radio resources only when there is data to send and it reduces reliance on traditional circuit-switched network elements." (Cisco) GPRS will allow service providers to build an infrastructure that will provide an easy migration to a 3G network. GPRS allows operators to build an IP based core architecture for data applications that will allow testing and development of integrated voice and data services and applications.

When considering the market potential for GPRS, one needs to look at the penetration of GSM, which is the most prominent digital standard in the world. The figure below shows the GSM subscriber growth since 1999 and forecasted growth for 2003:

Figure 2 – GSM Subscriber Growth



(taken from Cisco's white paper GRPS)

The chart shows a continual increase of 100 million users worldwide per year.

3G

3G is a radio communications technology that is designed to carry large amounts of data traffic quickly and cost effectively, providing higher-bandwidth connections to many users simultaneously. It has been optimized for multimedia services and high-speed Internet access. "The International Telecommunications Union (ITU) recommendations for the IMT2000 standard for next-generation services, a data rate of 2Mbit/s indoors is envisaged. In the wide-area environment - on suburban streets, on the train or in the car, for example - IMT-2000 envisages a data rate of up to 384kbit/s." (3G NewsRoom)

The following chart shows the progression in technology from 1G to 3G:

Figure 3 – Progression in technology from 1G to 3G

	TECHNOLOGY		FEATURES
1G	**AMPS**	Advanced Mobile Phone Service	-Analog voice service - No data service
2G	**CDMA** **TDMA** **GSM** **PDC**	Code Division Multiple Access Time Division Multiple Access Global System for Mobile Communications Personal digital cellular	Digital voice service 9.6K to 14.4K bit/sec. - CDMA, TDMA and PDC offer one-way data transmissions only Enhanced calling features like caller ID No always-on data connection
3G	**W-CDMA** **CDMA-2000** **TD-SCDMA**	Wide-band Code Division Multiple Access Based on the Interim Standard-95 CDMA standard Time-division synchronous code-division multiple-access	- Superior voice quality Up to 2M bit/sec. always-on data Broadband data services like video and multimedia Enhanced roaming

(http://www.3gnewsroom.com/html/intro_3g/index.shtml)

As the chart indicates, 3G will offer better quality in service with faster transmission speeds and the ability to be always connected. With users being connected all of the time, there will have to

be a change in charging, where the user is charged for the amount of information transmitted as compared to the length of time they are connected.

The following chart shows the applications that have been commonly used with each technology:

Figure 4 – Applications for Wireless Technology

The technology of most current digital mobile phones **Features includes:** Phone calls Voice mail Receive simple email messages **Speed:** 10kb/sec **Time to download a 3min MP3 song:** 31-41 min	**The best technology now widely available** **Features includes:** Phone calls/fax Voice mail -Send/receive large email messages Web browsings Navigation/maps New updates **Speed:** 64-144kb/sec **Time to download a 3min MP3 song:** 6-9min	**Combines a mobile phone, laptop PC and TV** **Features includes:** Phone calls/fax - Global roaming Send/receive large email messages High-speed Web Navigation/maps Videoconferencing TV streaming Electronic agenda meeting reminder. **Speed**: 144kb/sec-2mb/sec **Time to download a 3min MP3 song:** 11sec-1.5min

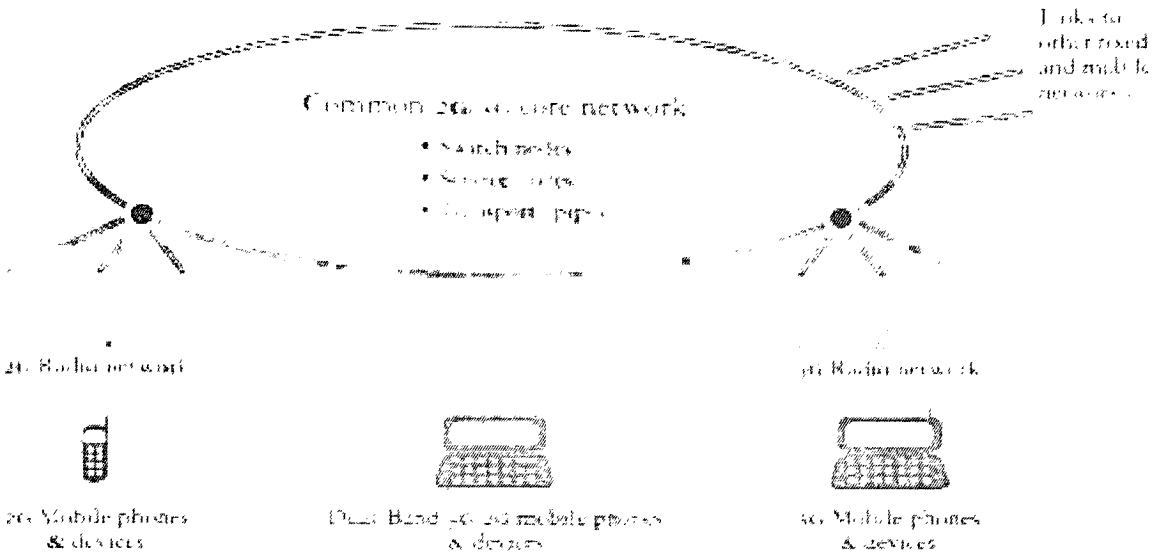
source: Newsweek

(http://www.3gnewsroom.com/html/what_is_3g/index.shtml)

When GSM, TDMA and CDMA standards were created they were developed with the entire network in mind. The handset, radio communications and core network were all part of the standard. The approach for the 3G standard is different in that there will be one for the radio

network and one for the core network. The following diagram shows how a 3G network will look.

Figure 5 – 3G Network Diagram



By separating the radio network from the core network, it will allow interconnectivity between different technologies. As the diagram shows, the core network will connect to a 2G and 3G radio network as well as other fixed and mobile networks. Once the standards are in place, the issue of technology will be a minor point with the focus being on services and applications.

Bluetooth

Bluetooth, developed by Ericsson Mobile Communications in 1994, is considered a low cost, low power solution for transmitting information between non-wired connected devices. This enables mobile computers, phones, and portable handheld devices that comply with the Bluetooth specification to connect to each other and to the Internet. The original idea for Bluetooth was to remove the cables that connects devices and replace these cables with a chip

that allows transmission and receiving of data, such as a computer to a printer. The idea then grew into transmitting data between mobile phones and printers; printers to printers and the ideas are continuing to emerge.

Devices that are equipped with the Bluetooth chips have a range of 10 meters and can transfer data about 720Kbps through walls, clothing and briefcases. "When two Bluetooth-enabled devices come in range of each other, software embedded in the Bluetooth transceiver chips automatically initiates a connection and sends and receives data." (Lortz) This allows different devices to easily communicate and connect with each other. One disadvantage is that due to its short range and limited speed, it is less suitable to work with wired LANs where devices are located beyond the 10 meters range and transmit at speeds from 10Mbps to 100Mbps.

In order to ensure success with creating Bluetooth as a standard, Ericsson formed a coalition in February 1998 with IBM, Intel, Lucent, Nokia, 3Com, Agere Systems, Toshiba and Microsoft, and started the Bluetooth SIG (Special Interest Group). "The purpose of the group was to monitor the development of Bluetooth, making it a global, open, short-range radio standard that would permit interoperability between all Bluetooth-enabled devices." (Lortz) The first specification was released in July 1999 with Bluetooth-enabled devices becoming available to the market in 2000. There are over 2,500 participating companies in the Bluetooth SIG with a simple membership policy that states, "Any company can join the group, with the stipulation that it permits all other members to use any Bluetooth technology it develops, royalty free." (Lortz)

WAP

Wireless Application Protocol (WAP) was introduced in 1999. The WAP Forum defines the Wireless Application Protocol as "an open, global specification that empowers mobile users with wireless devices to easily access and interact with information and services instantly." (WAP Forum) WAP's purpose is to enable fast delivery of information and services to mobile devices and is designed to work with most of the wireless networks. According to the WAP Forum, WAP is a communications protocol and applications environment that can be built on any operating environment. "The WAP standard is based on Internet standards (HTML, XML and TCP/IP). It consists of a WML language specification, a WMLScript specification, and a Wireless Telephony Application Interface (WTAI) specification." (W3Schools)

"WAP is positioned at the convergence of three rapidly evolving network technologies, wireless data, telephony, and the Internet." (WAP) The WAP protocol provides a means of creating customized user interfaces so that developers can take what has been designed for desktop machines and deliver the information on a handheld wireless device. The WAP programming model is basically the same as the WWW model with enhancements.

Figure 6 – WAP Model

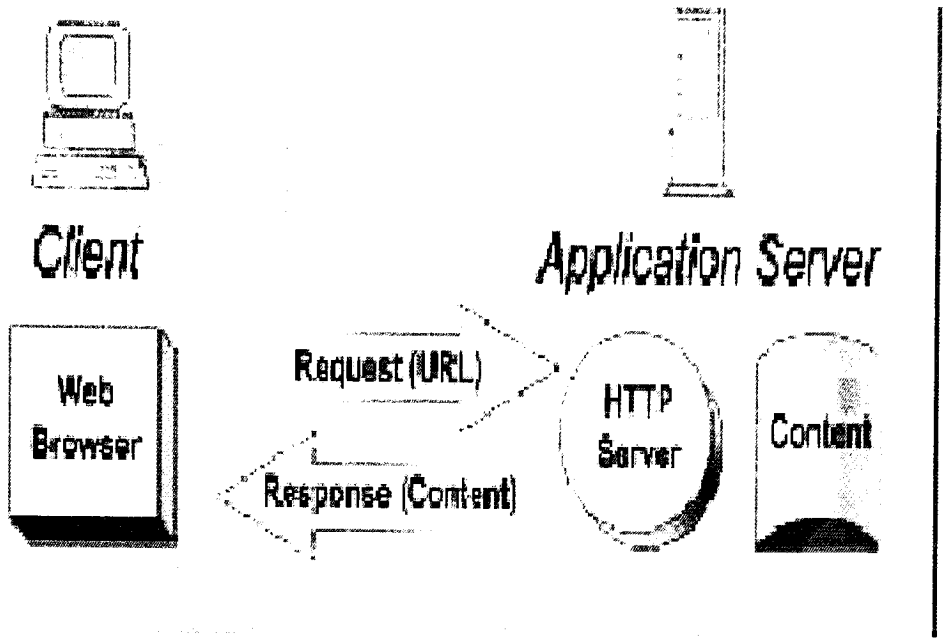


Figure 1. World-Wide-Web Programming Model

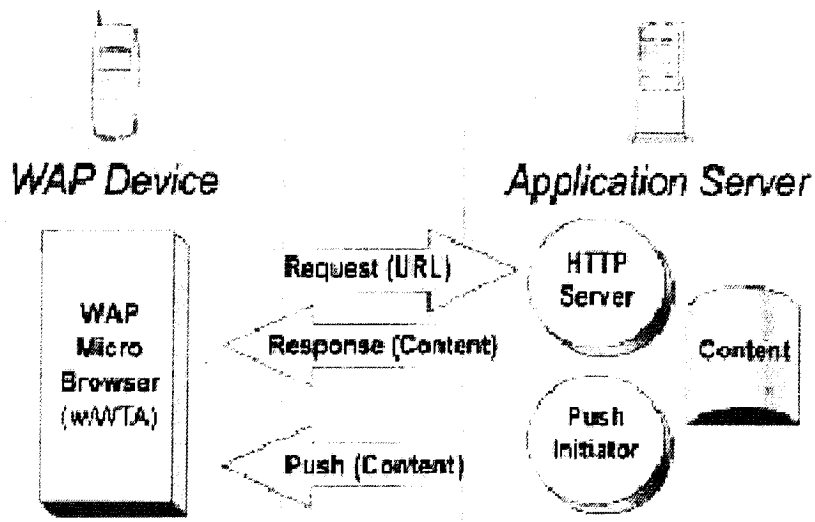


Figure 2. WAP Programming Model

(taken from Wireless Application Protocol Architecture Specification WAP-210-WAPArch-20010712)

The most significant enhancements to the WAP programming model are a push mechanism and telephony support. WAP defines a set of standard components that enable communication between mobile terminals and network servers, including (WAP):

- Standard naming model – WWW-standard URLs are used to identify WAP content on origin servers. WWW standard URIs are used to identify local resources in a device, e.g. call control functions.
- Content typing – All WAP content is given a specific type consistent with WWW typing. This allows WAP user agents to correctly process the content based on its type.
- Standard content formats – WAP content formats are based on WWW technology and include display markup, calendar information, electronic business card objects, images and scripting language.
- Standard communication protocols – WAP communication protocols enable the communication of browser requests from the mobile terminal to the network web server.

J2ME

Sun Microsystems introduced Java 2 Micro Edition to meet the needs of the industry manufacturers that are building devices from handheld devices to desktops. J2ME is a very small Java application environment that Sun has provided for developers to use in a variety of markets. The highlights of J2ME are:

- Provides Java technology solutions for building devices across the spectrum – palmtops to desktops
- Simple for consumers to use, programmers to develop to, and service providers to deploy
- Delivers the foundation for intelligent and dynamic networked content
- Offers a technology framework focused on any device utilizing it
- Provides the networked consumer with a technology framework that crosses the device spectrum

- Enables anytime, anywhere deployment of services

According to Wireless Business & Technology, there are several trends occurring that show Java as having success in the wireless market. These trends are (WBT, p.28):

- **Java phones are shipping:** The first Java-enabled handsets from manufacturers such as Nokia, Motorola, and Siemens are now shipping – with many additional models in the pipeline. Nokia alone will ship 50-million Java-enabled phones in 2002. By 2004, an estimated 524-million Java-enabled devices will be purchased by subscribers (source: ARC Group projection).

- **Wireless Java has proven successful:** NTT DoCoMo's Java application download service doubled average packet usage within six months of its introduction. Data revenue increased $37 per user, or 60%, over subscribers without Java-enabled phones (source: NTT DoCoMo analyst presentation). While their success is due to a combination of factors, some unique to their market, the abundance of compelling applications if often attributed to the operator's revenue share model with developers.

- **Standards are emerging for application downloading:** Sun and other industry members, such as Nokia, Nortel, and Vodafone, are collaborating on standards for key parts of the end-to-end Java download experience through the Java Community Process (JSP). Standards for application downloading will provide a uniform experience for subscribers and a reliable OTA protocol for developers and operators.

- **Packet networks are materializing:** Network-based Java apps, especially games, will benefit from the rollout of 2.5 and 3G packet data networks. These networks will render multiplayer games more usable by providing always-on connections and faster data rates, making play more responsive.

- **The overall number of Java applications is growing:** Developers from the SMS and WAP communities, as well as developers new to wireless, are publishing new Java applications every day. Gaming companies like Picofun and Macrospace are building fun multiplayer games with capabilities that far exceed those built on WAP or SMS technology. In addition, enterprise applications, such as expense reports and inventory control, take advantage of both the network and offline capabilities of Java.

WEP

Wired Equivalent Privacy (WEP) was part of the original IEEE 802.11 standard with a goal of providing the same level of privacy as is found in a wired LAN. Wired LANs (IEEE 802.3) are protected by physical boundaries such as walls or limiting access to buildings, but wireless LANs have no real physical boundaries as the transmissions can penetrate walls. "As a result, WEP encryption was added to the IEEE 802.11 standard to provide an equivalent level of privacy similar to a physical boundary (like a wall)." (WEP) Briefly, this is how WEP works:

> "If a user activates WEP, the NIC encrypts the payload (frame body and CRC) of each 802.11 frame before transmission using an RC4 stream cipher provided by RSA Security. The receiving station, such as an access point or another radio NIC, performs decryption upon arrival of the frame. As a result, 802.11 WEP only encrypts data between 802.11 stations. Once the frame enters the wired side of the network, such as between access points, WEP no longer applies." (Geier)

There are many concerns about security when using wireless networks. Businesses need to take precautions and secure their network from someone who might be standing outside their premises and capturing data traffic, to someone capturing traffic from one of their mobile devices of their employees. WEP alone will not protect data from being captured or preventing an intruder from entering a network. "The Wireless Ethernet Compatibility Alliance (WECA) claims that WEP - which is included in many networking products - was never intended to be the sole security mechanism for a WLAN, and that, in conjunction with traditional security practices, it is very effective." (Whatis)

Standards/Technology Conclusion

The U.S. m-business industry has many choices to make in deciding on what type of network, protocol, development software for applications and security during the transfer of data, before the market can begin to mature. Until standards are established or the market dictates what direction the industry will take, the U.S. market will continue to lag behind the rest of the world markets. Established standards will set a foundation that service providers and businesses can use to build a mobile environment that will improve the accessibility of information anywhere and at anytime.

SERVICE PROVIDERS

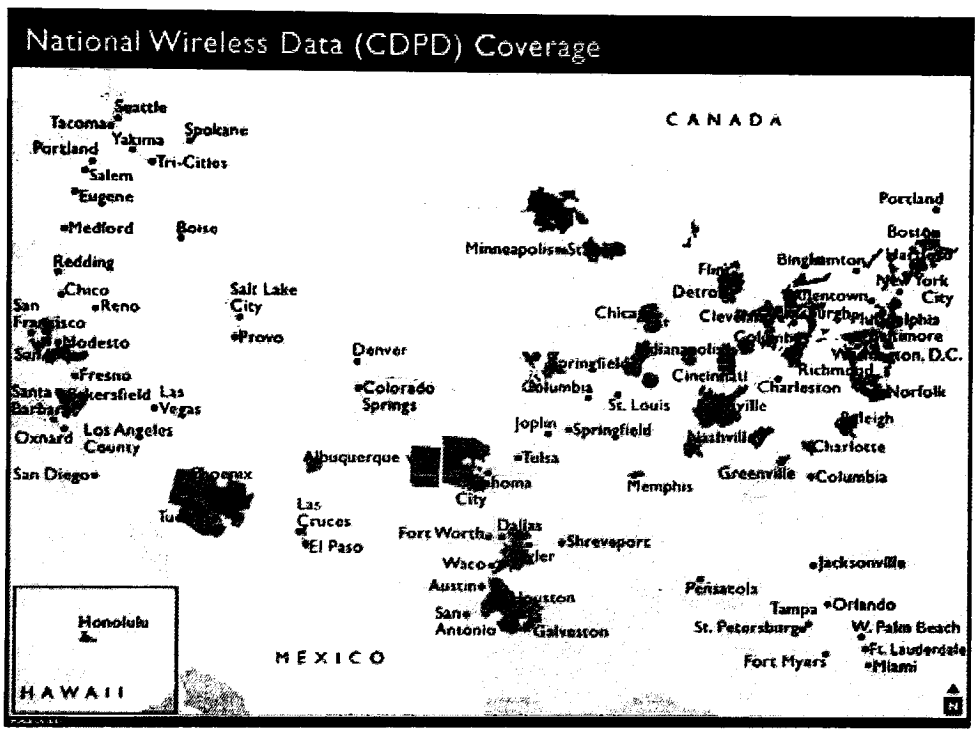
The main service providers for network service in the United States are AT&T, Cingular, Verizon and Sprint. Each provider is currently planning to or has already implemented a 3G network to support transmission of data. AT&T and Cingular have chosen to go with GSM technology while Verizon and Sprint have opted for CDMA. Another service on the horizon that will allow the mobile user to connect to the office and Internet while traveling is Connexion by Boeing.

As can be seen by the following coverage maps of each service provider, each provider has limited national coverage for data networks. Most of the coverage is concentrated around major cities or areas with large population densities. This is another reason why the U.S. m-business market has experienced slow growth. With limited access to a network, businesses are not willing to spend money on wireless technology when only part of the area where they conduct business is covered by wireless access. Wireless coverage will be a major factor to the growth of this industry, and could determine just how much growth the m-business market will experience.

Figure 7 - AT&T Coverage Map

■ Coverage Maps

Below is a map of the coverage area for the region you've selected.



AT&T Wireless Data Service coverage provided by AT&T Wireless.

Coverage is provided by a non-AT&T Wireless carrier. All representations regarding wireless data coverage are based on information prepared by the non-AT&T Wireless carrier and AT&T Wireless is not responsible for such representations.

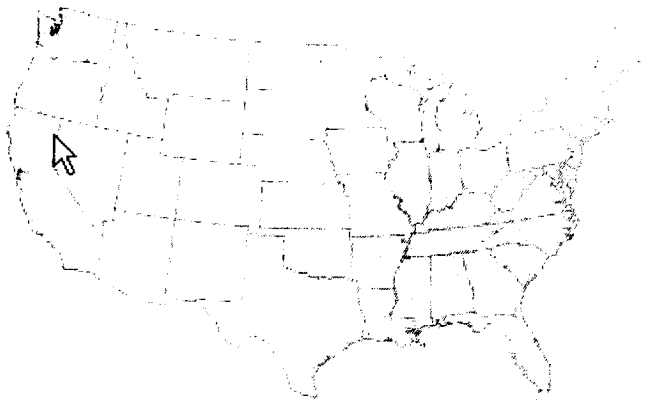
AT&T Wireless Data Service uses the AT&T Wireless data network, which differs in coverage from the AT&T Wireless voice network. Therefore, you will not be able to use AT&T Wireless Data Service in all areas where wireless phone service is available. This map is a general representation of wireless coverage and the areas shown are approximate. Actual coverage depends on system availability and capacity, system repairs and modifications, customer's equipment, terrain, signal strength, weather and other conditions.

This map is a general representation of coverage. Coverage areas shown are approximate. Actual coverage depends on system availability and capacity, system repairs and modifications, customer's equipment, terrain, signal strength, weather conditions and other conditions.

(http://www.attws.com/bus/sm_biz/ps/wireless_data_rates.jhtml)

Figure 8 – Cingular Wireless Coverage Map

Mobitex US Map

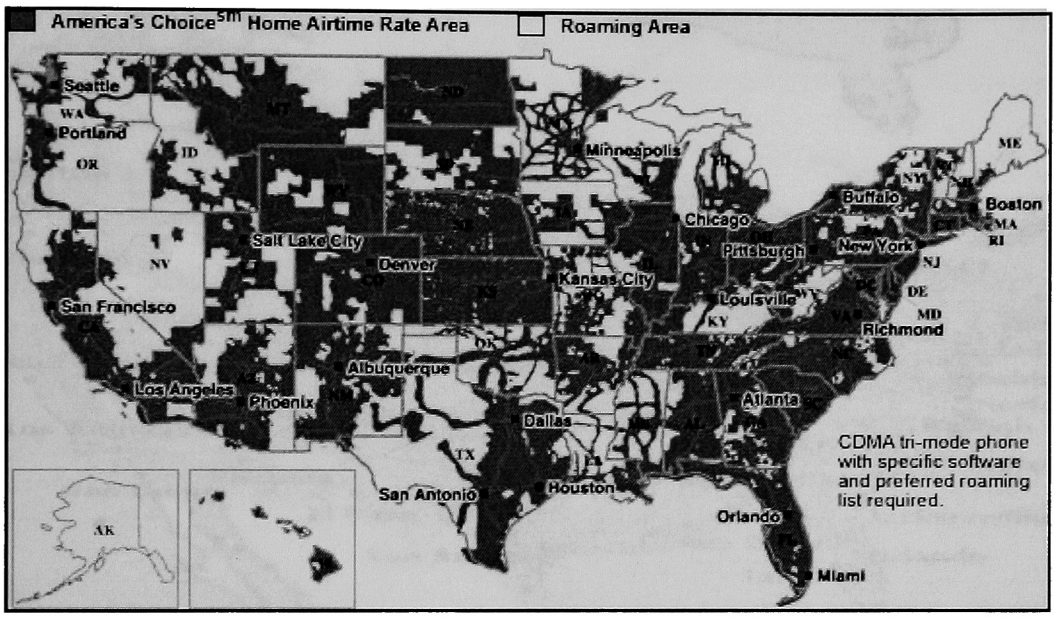


Coverage No Coverage

The service area contours are predictions based on computer models and a number of assumptions, including but not limited to, use of a radio modem similar to an Ericsson radio modem with external antenna. Actual service area will vary due to terrain, signal strength, customer selected devices, antenna type and placement (i.e., is the device on the floor of a car, or on the seat, is there an external antennae, if so is it extended), transceiver operating characteristics, obstructions, building density, construction, environmental conditions and other factors. Because so many factors influence coverage and significantly the radio modem selected by the customer, Cingular recommends that you conduct field tests with the device you choose to verify that the coverage area (service area contours) meets your requirements. Subject to the above, this map is a reasonable depiction of coverage as of March, 2002, but it is not a guarantee of coverage availability for any specific devices.

(http://www.cingular.com/bus_solution/bus_wdata_mobitex_coverage)

Figure 9 – Verizon Coverage Map



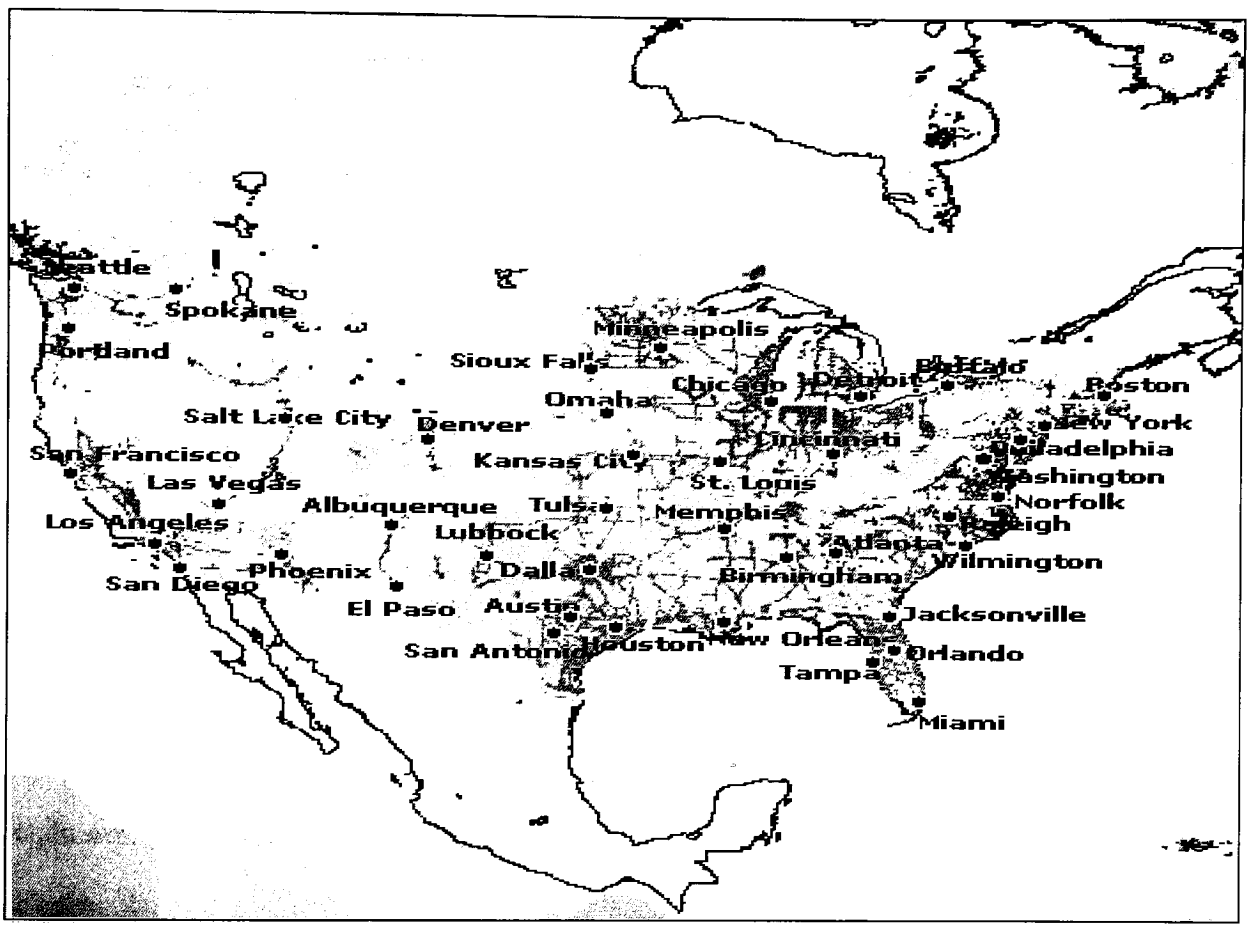
(http://www.aircharge.net/default.asp?../verizon_coverage.htm~main)

Sprint

Sprint launched its Code Division Multiple Access network in August 2002, which it is calling the PCS Vision network. "Sprint bases its network on a Code Division Multiple Access technology called 1xRTT [or CDMA 2000], which today has average speeds between 40K and 60K bit/sec, and can support bursts up to 144K bit/sec – the same technology Verizon uses." (Mears) Sprint will launch its 3G network with 100% coverage whereas Verizon introduced their service with about 20% coverage in January 2002. Even though Sprint announced 100% or nationwide coverage, the coverage is in areas that have a population of 100,000 or more. (Shaw)

The following chart depicts Sprint's coverage:

Figure 10 – Sprint Coverage Map



(http://www1.sprintpcs.com/explore/coverage/NatwideNetwk.jsp?FOLDER%3C%3Efolder_id=428663&CURRENT_USER%3C%3EATR_SCID=ECOMM&CURRENT_USER%3C%3EATR_PCode=None&CURRENT_USER%3C%3EATR_cartState=group&bmUID=1031865041487)

Connexion by Boeing

Boeing has addressed the needs of the air traveler by establishing a company called Connexion. "Connexion by Boeing is a proven Mobile Information Services Provider, bringing inflight broadband services to airplanes for the benefit of passengers, crew and operators." (Boeing) This service will allow business travelers the opportunity to stay in touch with the

office while inflight to their destination, eliminating the need to catch up with work upon arrival. With connectivity comparable to that found in most offices, Connexion by Boeing has created a digital office in the sky allowing the passengers to communicate with email, modify reports and presentations, watch streaming video and use the Internet.

Connexion by Boeing not only provides customer service to the travelers but also offers the airline operators the ability to use this service for operational purposes. "Its dynamic broadband capability makes it possible to monitor from the ground the performance of airplane systems, speeding maintenance and reducing delays." (Boeing) Future applications being considered are wireless distribution of inflight entertainment and the ability to examine ill passengers remotely examined by qualified medical professionals on the ground. The wireless distribution would eliminate the need to run cables throughout the airplane thereby reducing weight of the airplane, storage and maintenance costs. As an example, a wireless LAN on a Boeing 777 would eliminate the weight, complexity and power requirements of nearly 2,000 onboard line-replaceable units (LRUs) required for the In-Flight Entertainment system. "Less weight and complexity means the airplane can fly farther, haul more freight and burn less fuel. In the cabin, an e-enabled airplane makes reconfiguring seating layouts simpler." (Boeing)

Other potential applications that would deliver value are:

- Inflight Video Teleconference – of unquestioned value to the Executive Services market, which includes operators of private business jets and government VIP jets.
- Remote medical evaluations
- Enhanced security, including audio/video cabin monitoring
- Voice services
- Streaming data
- News and entertainment
- Wireless cabin networks
- Crew information services
- Inflight reservations and check-in
- Fleet management, operations, and maintenance data

The current market for this service is approximately 13,000 airplanes in operation today and Boeing estimates that by 2012, there will be 21,000 airplanes in operator's fleets. With business travelers preferring to travel on non-stop flights, and with improvements in airplane technology that allows flights of up to 18 hours, Connexion by Boeing will offer the businessperson the ability to stay connected with work and customers. The ability to be productive in flight will reduce missed opportunities, maintain communications with their work, allow the traveler to be more productive and prepared upon arrival, and eliminate lost hours or days due to the employee having to catch up with work when back in the office.

Market research conducted by varying groups shows that there is a strong interest from passengers and airline operators for Connexion by Boeing. The research shows that:

- **50%** of travelers (all classes) have a strong interest in inflight email and Internet access; three in five said they would be willing to pay for it. Half of those who were willing to pay said they would be willing to pay $20 or more for inflight connectivity. (Source: International Air Transport Association, 2002)

- **75%** of business travelers carry laptops

- **62%** of U.S. frequent business travelers are either "extremely" or "very" interested in Connexion by Boeing broadband services. (Source: Connexion by Boeing research)
- **18%** of frequent fliers (U.S.) and nearly (20%) of frequent fliers (Europe) said they would pay $35 per flight for Connexion by Boeing's broadband service offering. (Source: Connexion by Boeing market survey)

- **10%** of frequent fliers (U.S.) said they were extremely likely to switch carriers for broadband. (An average increase of a single passenger per international flight is worth approximately $1 million in additional airline revenue annually).

- **6%** of frequent fliers say they would abandon frequent-flier programs if necessary to obtain connectivity; **3.4%** of U.S. travelers say they would switch airlines to obtain connectivity even if it meant paying more and losing their preferred frequent flier program.

EQUIPMENT

Appendix A is a 2002 Handheld trend survey conducted by Synchrologic that questioned Information Technology managers on their views of handheld devices. The data from the survey supports the assertion that mobility within the enterprise environment is about two years away. Within 18 months, 70% of the respondents said that handheld devices will be centrally managed within their organization and 50% plan on mobilizing their enterprise applications. According to the data, email will probably be the first application to become mobile, as both internal and external communications are vital to business.

The survey reveals that most I.T. managers are leaning towards wireless as the preferred technology in mobilizing the workforce over a wired modem. The main drivers for this movement towards mobility are not so much ROI but a competitive advantage and improvement in customer service. Businesses are viewing a mobile workforce as a way to improve operations, improve efficiency within their organizations and increase customer satisfaction by being able to communicate in a timelier manner.

The mobile worker's equipment can consist of a PDA (personal digital assistant), mobile phone, pager, laptop and/or notebook. There use to be a clear distinction between each of these devices, but nowadays mobile PDA-phone hybrids are entering the market with allot of interest and acceptance. Users don't wish to have to carry multiple devices in order to communicate with the office. They would prefer one device that they can use for mobile telecommunications and storage and transmission of data. The PDA-phone hybrids have the potential to be this device.

This concept of a hybrid device is not new but is gaining acceptance due to improvements in size, design and functionality. Earlier models were considered bulky and limited in their functionality. Today's models with their improvements are maturing as

communication tools. The main advantage of hybrids is that the user only has to carry one device, providing convenience and timesaving features.

The hybrid concept is not without its disadvantages. Dr. Don Norman, author of "The Design of Everyday Things" and "The Invisible Computer", suggests that in order for the device to work well, "you have to use a microphone-earphone headset, which essentially adds another device anyway. But if they're coupled tightly together, the concept can work." (Perry) Norman doesn't recommend speakerphones as they create noise pollution and unintentional eavesdropping problems. Dr. Norman recommends the Handspring Treo as the best hybrid available on the market today.

There are advantages and disadvantages to combining a PDA with a cell phone. The advantages of hybrids are:

- Portability - hybrids allow a user to carry one device, integrating voice and data storage and reducing bulk
- Flexibility - software options are increasing, especially with Palm OS. Users can download new software and applications that meet their needs.
- Users can personalize their display options
- Capable of wireless Internet access

The disadvantages of hybrids are:

- One device – if the device breaks or is lost, the user looses all functionality
- Screen size is smaller than most PDA's
- Due to the use of two technologies, battery life is an issue

Pagers/Mobile Messengers

The early type pagers were one-way communication devices that allowed the user to receive alphanumeric messages. Other than contacting the user to call someone or alerting him or her of an emergency, the pager is restricted in functionality. Evolved from the pager is a two-way communication device called a mobile messenger that combines instant messaging, email capabilities, simplified information management, Internet access and cell phone capability.

The most popular of the mobile messengers is the Blackberry device from Research in Motion. The Blackberry device provides the user with a constant always on, wireless connection to your email account that can be integrated with most enterprise email systems such as Microsoft's Exchange or Lotus' Domino. Each model of the Blackberry is equipped with a QWERTY style keyboard and LCD screen making the input of information similar to that found on laptops and desktop PC's. The Blackberry alerts the user of incoming email by an audible tone or vibration that the user can read and then reply. The user can see if there are attachments and the size of the attachment, but is unable to open them via the Blackberry. Besides being unable to open attachments, another negative is the associated costs for the devices, software and monthly service fees for network connection and Internet access.

Mobile messengers have a niche market in the m-business model when it requires the user to be in constant contact with their businesses and email. But the lack of functionality and the capability of having the same functions in other devices, make it a less than desirable solution for information anywhere, anytime.

PDA's

Personal Digital Assistants (PDA) origins began with the Newton MessagePad by Apple Computer in 1993. Today there are many models from different manufacturers. But the first choice in making a decision is what operating system best supports the business requirements. The two choices are the Palm OS that operates on the devices from Palm, Handsrping and Sony, and Pocket PC that uses Microsoft's Windows CE and runs on devices from Compaq, Hewlett Packard, Casio and others.

The Palm OS is focused on a narrow set of everyday tasks and routines that users need from a PDA. "The Palm philosophy continues to revolve around portability, ease of use, and task-specific functionality. In a nutshell, the Palm OS advantage over the Pocket PC is that it focuses on doing a limited number of critical jobs extremely well." (Smith) Some of the main functions of the Palm OS are an address book, calendar, memos or notes, calculator, expense reporting and a task list.

The Palm OS can interact with a desktop PC by loading the PC-based Palm desktop software and connecting the Palm to the PC. By utilizing the HotSync software that comes with the Palm OS, the handheld device and PC can be synchronized, updating data in the Palm applications. This synchronization includes transferring data that is compatible with applications such as Microsoft Outlook, Excel and Word making it a serious productivity tool for the business user. Another feature of the Palm OS product is that there are more than 10,000 third-party programs available that include office suite applications and databases.

The Palm OS has offered wireless connectivity for about the last two years when the Palm VII with its built in modem was released. Palm's proprietary wireless network, Palm.Net, offers, "users access to email and stripped down versions of some Web sites." (Smith) The latest

device, the Palm i705, offers an always-on connection to Palm.Net allowing users to receive alerts on incoming email and provides Web browsing of the Internet. Palm has its own portal to the Internet where it has partnered with more than 600 content sites. Also, a hardware and software upgrade will allow most Palm OS devices to connect to a Wi-Fi network providing faster connection to the Internet than a wireless modem.

The Pocket PC platform is designed to look, feel and operate like a Windows OS desktop found on most PC's today. The Pocket PC is similar to the Palm OS in that it provides the same task like functionality such as a calendar, to do list, address book, notes and an email inbox. But other than that, the Pocket PC has more of a Windows-like functionality with versions of all of the Microsoft Office suites designed for the Pocket PC. The majority of Pocket PC's have a high-resolution color display because the OS was designed to meet this need. There is also a version of Windows Media Player for playing audio and video clips and a recorder for dictation.

Similar to the Palm OS, the Pocket PC can connect to a desktop PC and synchronize data by using Microsoft's ActiveSync software. "Unlike Palm, the Pocket PC approach does not re-create the PDA on your desktop PC so much as it farms data files in to and out of the relevant programs on your PC." (Smith) ActiveSync maybe the weakest feature of the Pocket PC as there are issues with consistent and reliable connections when communicating with a PDA.

In order to utilize a wireless connection on a Pocket PC PDA, add-ons are required. Pocket PC's do not come with built-in wireless modems and therefore require a cell phone to act as a modem or the Pocket PC can use a clip-on "sled" that has a cell phone style antenna. The Pocket PC OS was built with wireless access as a main consideration. The OS includes a version of IE designed for a PDA and also includes an instant messaging client. To compete with Palm's proprietary network, Microsoft will be offering its own .NET program, were it "promises to

migrate a host of new and familiar programming and networking tasks onto the Web rather than through standalone software." (Smith) Microsoft plans to make most .NET functions compatible with the Pocket PC platform making information available anywhere and at anytime.

The decision as to which PDA to select will depend on the business or consumer requirements and the question of how much functionality is required from the handheld. Based on current sales, there is no one PDA OS leading the market. With Palm devices selling for around $99 it seems to be attracting the consumer market while the Pocket PC with its built-in Windows compatibility is gaining momentum in the business market.

Laptops/Notebooks

The main drawback on laptops and notebooks are their size and weight, and cost. They are not as portable as a cell phone or PDA. But they still are an important device for the mobile user. They offer the user full functionality and capability as if they were in the office. Their advantage over some other wireless devices is that when wireless access is not available, they can connect to their network via a modem and landline.

APPLICATIONS

Short Messaging Service/Texting

The U.S. messaging service is beginning to show promise as a revenue generating business for carriers. "One example of this is a recent Cingular press release in which they disclosed that their SMS messaging volumes have increased 450% since January." (Lubar) Many carriers are looking at SMS as a way to increase revenues to move them into the black and help with the 2.5/3G deployment costs. But there are major issues ahead of the U.S. market such as the problem of interoperability due to a fragmented carrier market. The main question is how do you get a SMS test message from one carrier's customer to another carrier's customer and bill the carrier and customer.

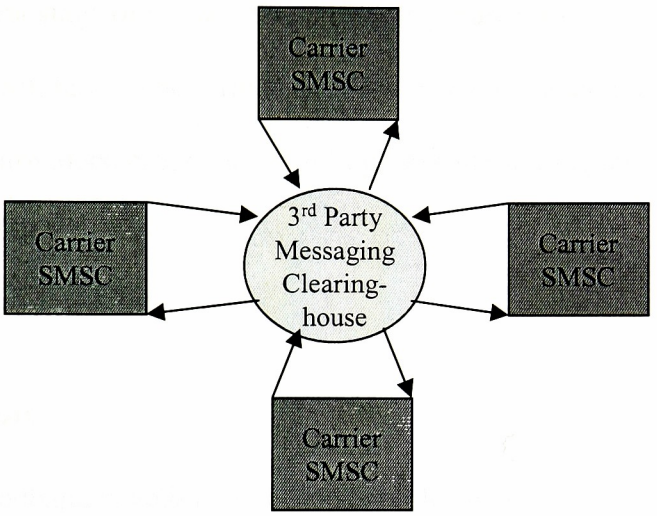
In other parts of the world, the SMS interoperability issue has been resolved by utilizing messaging clearinghouses known as InterCarrier Message Exchanges (ICMXs). In GSM-based markets around the world, such as Hong Kong, Israel, Korea and South America ICMXs have been used with great success. "Once an ICMX has been put in place, messaging volumes have jumped significantly." (Lubar, p.16) As an example, when Inphomatch created an ICMX for AT&T Wireless, after the first three months, messages scaled to 30 million messages a month.

The ICMXs will be a third party venture rather than a carrier built one due to the complexity of the architecture. Figure 11 illustrates the complexity of a carrier-to-carrier ICMX architecture as compared to a third party approach.

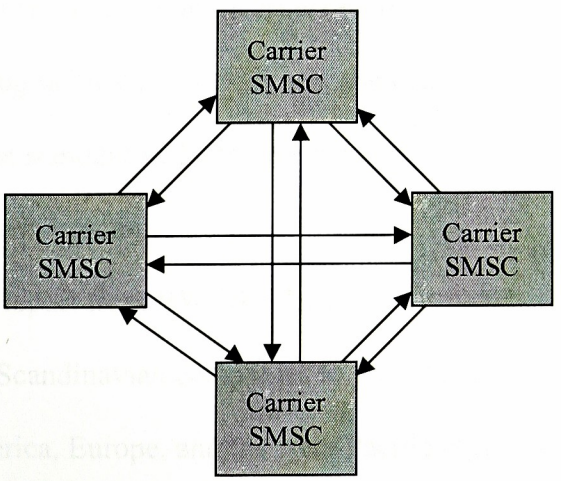
Figure 11 – SMS Architectural Comparison

Inter-Carriers SMS Message Flow Architectural Comparison

The more simple
3rd party ICMX architecture



The more complex
Carrier-to-Carrier ICMX architecture



(taken from Wireless Business & Technology, April 2002. Vol.2 Issue 3, p.16)

SMS will have to be a cooperative effort in order for text messaging to be widely adopted in the U.S. There are already announcements from software provider Logica about creating a Global SMS exchange network called the Global Interconnect Network that will allow operators to send messages to any point on the planet. And there are groups forming to create industry standards for Multimedia Messaging Services (MMS), which would be the next step to SMS. But in order for the first stage of the wireless messaging market to grow in the U.S., alliances between carriers will have to be formed. ICMXs have the potential to solve message exchange between service providers, cross-carrier billing, revenue sharing and quality of service monitoring for SMS.

WLAN/HotSpots

Small broadband islands called "hotspots" located in areas such as airports, hotels, conference centers, retail chains and cafes allow users to check their email, surf the Internet or conduct business. Wireless Local Area Networks (WLAN), also known as Wi-Fi, connect mobile devices in a limited area making workers more productive and mobile. This eliminates the end user from having to locate a modem port and connect at slow speeds. WLANs are based on the wireless Ethernet standard 802.11b and can deliver access speeds up to 11 Mbps within 50 150 meters of each radio beacon.

According to a report from BWCS, a British consultancy group that surveyed efforts of several American and Scandinavian companies to provide high-speed access for business travelers in North America, Europe, and the Asia-Pacific region, titled Wireless LANs and the Threat to Mobile Revenues, "by 2006 every conceivable venue where business users may demand access to the Internet from their mobile PC's will be covered by Wi-Fi service

providers." (Gustafsson and Sandred) It is estimated that there will be 130 million wireless enabled mobile computing devices capable of connecting to WLAN hotspots. WLAN could be considered a threat to the planned 3G networks, as it is already available, 3G networks are still approximately 1 year away from deploying and WLANs offer better access speeds. In addition, BWCS estimates that fewer than 90 million mobile customers will utilize the provider's services for GPRS, WAP or 3G, meaning that hotspots will threaten some of these service providers revenue.

There are some strong numbers to support that hotspots will be a strong segment of the wireless market, both in the U.S. and in Europe. By the end of 2001, there were 250 hotspots in Europe and 1,770 in the U.S. with 42% found in cafes and restaurants, 32% in hotels, 7% in airports, 1% in conference centers, and other locations representing the remaining 18%. "According to a forecast from BWCS, by 2006 there will be 115,000 hotspots worldwide, with the U.S. in the lead with 69,000." (Gustafsson and Sandred) And research company Cahners In-Stat, forecasts that in 2005 public-area WLAN end-user sales of products will reach an estimated $4.5 billion.

The main issue to the growth of public access WLANs is a billing method. How do the service providers charge the users for access and usage? Currently, hotspots individually invoice the users but as the number of hotspots and wireless users increase to the millions, a better method of billing is needed. Roaming, similar to how the European mobile telephony (GSM) works would be an ideal solution. Telecom companies roaming agreements would allow users access to any hotspot and not have to worry about billing issues or access agreements.

Location based services

The FCC has mandated that by June 2002, 50% of all new handsets that are activated must have location abilities and by December 2005 a phased rollout of E911 will begin, requiring that 95% of handsets in use by customers must have built-in location abilities. (McGarvey) This FCC order is known as the "E911 mandate" and is a result of legislation requiring cellular carriers to provide the location of anyone making a 911 call. E911 capable phones are already on the market as of mid-2002 and the GPS location service works where the cellular networks are new network installs.

The FCC's "wireless Enhanced 911 (E911) rules seek to improve the effectiveness and reliability of wireless 911 service by providing 911 dispatchers with additional information on wireless 911 calls." (FCC) The wireless E911 program is divided into two phases. Phase I requires carriers to report the telephone number of the caller and the location of the antenna that received the call. Phase II will require carriers to provide more precise information of the location of the caller, within 50 to 100 meters. (FCC)

According to Arthur Gum, a QUALCOMM senior product manager, "GPS may be the tool that brings out a lot of apps." (McGarvey) One app being developed by AT&T Wireless is a wireless concierge that will allow a user to ask the phone service where is the nearest restaurant and based on the user's location, a list of options will be provided. Another application is a friend finder or buddy list that could be used by parents and children or business associates to arrange a meeting.

There are competing location-based technologies. One is a network-based solution that uses the cellular signal to locate the phone, but is only accurate to within 900 feet of the phone location. This may be okay for some business applications but is not very effective if someone is

calling in for emergency assistance. The most accurate technology is Global Positioning Systems (GPS), which now has the capability to provide location even when the device is indoors. "As network-based solutions undergo field trials, many carriers are coming to the conclusion that GPS offers the greatest benefits in terms of cost, ease of integration, performance and return on investment." (van Diggelen)

Dr. Frank van Diggelen, VP of Global Locate, states that the E911 mandate is driving GPS technology into cell phones and that other wireless devices are being designed with consideration for GPS technology. (van Diggelen) Some of the other devices are watches for children, packages, trailers and containers. Just about anything you would want to track or know the location of will be available through GPS. This is now capable by installing two tiny chips into a cell phone or other device, integrating the antenna into the device and providing enough of a signal for position computation. This integration of the antenna into the device will eliminate the need to run external antennae's, such as would be found in vehicles, thereby reducing costs of manufacturing, repair and replacement. The elimination of having an external antenna will increase the number of applications and opportunities for this technology. According to van Diggelen, the indoor capable GPS enabled cell phone and similar wireless devices are about one to two years away. "These new products will enable valuable applications for the enterprise and the consumer – saving time, enhancing security, and reducing stress levels." (van Diggelen)

CHARGING FOR MOBILE DATA SERVICES

There currently exist no choices for charging for services. "Carriers are stuck with per-minute pricing, and providers have no real way to gain revenue share. The result: stagnation." (Kuchinskas) But according to a report from M-Business Research, "a new breed of intelligent network elements is emerging to let you charge flexibly for service and content, supporting some 17 charging options and innumerable new business models." (Kuchinskas) With these changes carriers will be able to charge by the packet, mobile content and service providers will have more control over charging options, and enterprise decision makers will have choices in how they will be billed for services.

Wireless carriers are starting to launch high-speed data networks offering fast access to information anywhere and anytime. But according to a Synchrologic article, High-speed Wireless Data: Still in Development, "analysts suggests that customers hold off on full-scale deployments while the market evolves". (Mears) The article goes on to state "As these so-called 3G services are unveiled, businesses will see a confusing range of pricing options and coverage plans." (Mears) Philip Redman, research director of mobile wireless networks at Gartner, says, "The coverage isn't there yet. Mobile devices are just starting to emerge that are next-generation data enabled." (Mears) Redman advises to wait until the platforms mature and prices start coming down before deploying to a large number of users.

Pricing for next-generation wireless services is not stable as price ranges from $1 to $7 per megabyte with the service being offered on a mix of next-generation technologies. There is a trend to sell data services by the megabyte but per-minute plans are also being offered. According to Patricia Leebove, director of e-business at Invacare, "today the benefits of wireless data services don't justify the costs." (Mears) Besides the cost of the service, companies have to

consider the cost of training the employees. Leebove states that her sales staff are not ready to transition into the wireless data world because they still find it easier to call sales support instead of checking the web site for prices or utilizing their email. Until Invacare can guarantee that the sales force would use the equipment and be properly trained, they cannot justify the investment.

One reason for the slow adoption of wireless data services is due to the development stage that it is in. Wireless data service is still in its infancy in the U.S. Businesses aren't convinced that there is much value at this point in time. Keith Waryas, research manager for wireless business network services at IDC says, "The market is in a bit of flux because the value of data hasn't been proven. It's going to be a slow adoption curve." (Mears) There are not many applications that businesses can utilize for efficiency in operations. Carriers are investing large sums into their networks to make them data capable, believing that users will pay a premium for data, according to wireless industry analyst Andrew Seybold, of Andrew Seybold Group. (Mears) Seybold states, "There is a discrepancy between what the corporate user thinks data is worth and what the wireless networks think they can get for data." (Mears)

Along with pricing concerns and what applications are available, coverage is one of the main reasons businesses are reluctant to make the investment in wireless services. Many believe that the speed and coverage are not there to support the demands to make it a viable option to conduct business. And, according to a survey of IT managers, "the threshold of pain for corporations' wireless data is a fixed fee of about $50 a month." (Mears) This is half of the cost of Verizon's $100 per month flat rate pricing plan released in May 2002 to corporations.

Upgrading the networks for wireless data will be costly. Sprint has invested $800 million to its CDMA network, which might allow it to offer data services at a more competitive price because AT&T and Cingular are having to invest about $3 billion to upgrade their networks.

(Mears) In comparison to what the U.S. providers are spending, "DoCoMo has committed $8.2 billion in capital spending over the next three years on their Japanese mobile services and has set a customer target of $6 million for FOMA by March 2004." (WBT, p.14)

From a consumer's point, if the service providers charge by the packet and utilize push methods to distribute information, end users could have high monthly bills. An example would be if the user receives alerts for emails or stock quotes. For each alert, the service provider would send packets to the user informing them that they have received an email message or that a particular stock has reached a certain level. Depending on the number of alerts received, the user could be surprised by an excessively high bill.

M-COMMERCE

In order for m-commerce to grow in the U.S. market, there needs to be a way of providing m-payments for customers to make their purchases and payments using their wireless devices. In May 2002, Sprint and eONE Global took the first steps in establishing a U.S. mobile payments network. There was a similar announcement in Europe earlier in 2002, when Vodafone Group and T-Mobile joined forces to establish a mobile payment network. In the U.S., Sprint will be responsible for the standards and marketing, while eONE Global will pursue other U.S. operators to join in developing the network.

The network will have to be secure and easy-to-use for both consumers and merchants. According to M-BusinessDaily, "Sprint and eONE Global will provide a trusted end-to-end purchase and payment system that is convenient, secure, and user-friendly for both consumers and merchants." (M-Business Daily, Sprint Plans Mobile Payment Network) Both companies believe that this will be the key driver for early adoption of m-commerce. The network will offer customers the ability to store personal data and payment options in a "virtual wallet", allowing them to choose which payment method to use when making payments with their mobile phone. The solution will allow credit and debit card payments, smaller purchases to be billed directly to the customers phone bill, to a stored value account offered by the operators and newer payment options.

The two companies are addressing some of the technology issues by utilizing their subsidiaries and affiliations with other companies. Encorus Technologies, a subsidiary of eONE Global, "will supply the underlying technology for the open standard platform including multiple channel access, authentication, routing and settlement of transactions." (M-Business Daily,

Sprint Plans Mobile Payment Network) As the number of users increases there will be an issue of processing transactions. This will be addressed by utilizing eONE's relationship with First Data and leveraging First Data's expertise and capability. First Data is currently providing payment processing for 2.8 million merchant locations worldwide.

According to a prediction from the TowerGroup, "the number of mobile premium content customers will continue to rise rapidly, reaching 118 million users in Western Europe in 2005, 145 million users in Asia-Pacific, and 22 million users in North America." (M-Business Daily, Sprint Plans Mobile Payment Network) TowerGroup estimates that "the total value of the mobile digital premium content market will rise from just over S2 billion in 2001 to $48.51 billion in 2005." (M-Business Daily, Sprint Plans Mobile Payment Network) The service providers will have to create a network that is standards based and/or built in flexibility, allowing the customer a variety of payments methods, across multiple operators and geographical locations.

In a white paper from 724 Solutions Inc. titled, "Commerce goes mobile: A service provider's guide to navigating opportunity, hype and reality", emphasizes the key to making m-commerce transactions successful is to ensure that the underlying facilitating technology remains invisible to both the buyer and seller. (724) 724 suggests that m-commerce service providers select, test, and refine their m-commerce offering today in order to gain a competitive advantage as early adoption rates continue to climb for m-commerce transactions. "To succeed, the efforts of the service provider need to be squarely focused on delivering value-added m-commerce services that enhance buyer-seller interaction resulting in increased dollar value and volume of transactions." (724) The m-commerce offering must be a highly scalable and secure wireless transaction technology and delivery system that is adaptable to the addition of new services and technology. "By adopting and implementing such a platform, service providers can focus on

executing their business model rather than continually struggling with technology challenges." (724)

M-commerce has not grown in the U.S. due to a few reasons. One reason is the "development of the concept has not budged since its so-called early stages." (Lyman) The first platform WAP is still being used and comes under heavy criticism and there have been little improvements in making the transactions better or different for the consumer. Jay Lyman, from Wireless NewsFactor states, "Until buying something on a wireless device -- including minutes, services or even ring tones -- progresses from being different to being better, the "m" will likely stand for "maybe not." (Lyman)

Another reason for the slow m-commerce growth in the U.S. was the overhype of the technology's potential. G2 research director Mike McGuire stated that, "We keep forgetting that technology and application potential increase with every new idea. Consumer behavior changes in geologic time." (Lyman) The increase in mobile devices is increasing but the consumer behavior is slow to change as only a very small percentage of users make purchases with their mobile devices. As an example, people with web-enabled phones will still use their cell phone to call an operator rather than search the web for assistance.

A third reason is the carrier's strategies on what consumers will buy over a wireless device. The carriers trying to sell usual consumer goods over a wireless device is not a good strategy, as many consumers will not use this type of device to purchase goods. Aberdeen Group's analyst Isaac Ro states, "I don't see it being a market that makes a ton of sense." (Lyman) Ro does mention that an affective strategy for carriers is to sell micro payments, where the carrier covers the bill, as well as ring tones, games and other add-on services. Anything that sells minutes is a good strategy according to Ro. (Lyman)

Another factor to the slow growth in m-commerce has to due with the culture of the U.S. people. "Another hurdle for m-commerce is the fact that most Americans are oriented strictly to talking on their phones, while users in Japan, Sweden and elsewhere are much more used to data and transactions on their mobile devices." (Lyman) The user environment is not ready to use the wireless devices for m-commerce transactions. Carriers and service providers are trying to find the right applications and approach to convince users. Despite the challenges, McGuire states, "There's still movement there -- there's still value there, predicting that widespread adoption of m-commerce is a couple of years away." (Lyman) In order for m-commerce to succeed, the process has to be better for the user, by either adding value or enhancing the experience of the current way consumers buy goods.

SECURITY

Providing a secure environment is crucial in order for businesses and customers to conduct wireless transactions without the threat of their information being captured by someone else. Commonly used Digital Encryption Standard (DES) is limited to a 56-bit- key size, meaning that security is minimal. Companies such as MediaCrypt license powerful encryption algorithm software based on the International Data Encryption Algorithm (IDEA) that has a 128-bit key that is used by military, government and businesses worldwide. According to Wireless Business and Technology, IDEA is "widely recognized and accepted as a vital business component in highly secure encryption systems, with hundreds of customer applications and millions of users worldwide." (WBT, p.15)

There is always the concern of security of information when a mobile device is lost or stolen. Baylor Health Care had this concern when they started deploying wireless handhelds to their medical staff, but didn't want to breach their patient's confidentiality if a device was lost or stolen. Baylor utilized a solution from wireless data and Internet service provider GoAmerica, and provider of wireless infrastructure management software mFormation Technologies, that allows Baylor to remotely lock or "zap" the device of sensitive data if the device is missing. The wireless devices are continually monitored by the management server which checks for device problems or performance degradations. Once a problem occurs, an administrator issues a command to either lock the device, or a zap command to delete the file systems, which deletes all the data on the device. If the device is locked, it remains in this condition until an unlock command is issued. If the device is zapped, an agent remains on the device allowing the management server to detect where on the network the device is located. This tracking

capability allows a device to be monitored as it moves around the network, assisting the administrators to detect if a device is lost or stolen.

The National Institute of Standards and Technology (NIST) issued a white paper titled, "Assigning and Enforcing Security Policies on Handheld Devices", in which they listed major issues in using handhelds and the associated risks. From a risk perspective the issues are:

- Because of their small size, handheld devices may be misplaced, left unattended, or stolen.
- User authentication may be disabled, a common default mode, divulging the contents of the device to anyone who possesses it.
- Even if the user authentication is enabled, the authentication mechanism may be weak or easily circumvented.
- Wireless transmissions may be intercepted and, if unencrypted or encrypted under a flawed protocol, their contents made known.
- The ease with which handheld devices can be interconnected wirelessly, combined with weak or no authentication of the parties involved, provides new avenues for the introduction of viruses or other types of malicious code, and also other forms of attack such as man-in-the-middle attack. (Jansen)

The NIST white paper gives two examples showing how a handheld's multiple access points can cause security problems to a corporations network. The first is through the IrDA port. An employee can beam a Trojan horse application to another employee that could enter the corporate network when the user synchronizes with their desktop PC. The second example is if the handheld is wirelessly connected to the Internet, the employee can upload or download data that violates the company's security policy or download a file that introduces a virus to the corporate network. The security of handheld devices requires companies to create a separate corporate security policy to reduce or eliminate these risks.

On June 12, 2002, the U.S. Department of Justice Federal Bureau of Investigation (FBI) website issued a press release stating:

> "The National Infrastructure Protection Center (NIPC) of the Federal Bureau of Investigation (FBI), the U.S. Small Business Administration (SBA), and the Commerce Department's National Institute of Standards and Technology (NIST) today signed a partnership agreement to provide computer and information technology security to help small businesses across the nation safeguard their information systems." (FBI)

This is a significant event as 99% of all U.S. businesses are small businesses of 500 employees or less. Protecting information of small businesses is therefore a major concern for the U.S. It is with the small business that many innovations take place and are deployed more easily due to their size. As the FBI states, "small firms produce many of the items that fuel the nation's economy. A vulnerability common to a large percentage of them could pose a threat to the national economy." (FBI) This alliance plans on offering training and workshops for small business owners to educate them in using proper information security and technology to protect one of their most valuable assets, information.

Since the terrorist attacks of September 11, 2001, there has been more of a focus on the United States' information structure and the President has begun a long-term program that will use advanced information management technology to better protect the nation. As stated on the Whitehouse's Homeland Security website, "... the President's 2003 Budget requests significant funding for cyberspace security, an essential new mission for the 21st century given our growing dependence on critical information infrastructure, most importantly the Internet." (Whitehouse Homeland) These initiatives to provide a better infrastructure for communicating between government agencies will have an impact on the mobile business market in the United States in regards to sharing of information and security of transactions.

Part of the President's program was the creation of a national board and designating a special advisor for cyberspace security. "Since October 2001, the President's Critical

Infrastructure Protection Board has organized national committees to streamline initiatives and address emergency planning." (Whitehouse Homeland) This has lead to a government-industry partnership to provide alert and warning for cyberspace threats and the creation of a national strategy. As found on the Homeland website, some of the components of this national strategy are (Whitehouse Homeland):

National Infrastructure Protection Center (NIPC). The President's Budget for 2003 requests $125 million to fund the NIPC, the premier cyberspace-threat response center located within the FBI. This request represents an increase of more than $50 million from the NIPC's base 2002 funding level.

Cyberspace Warning Intelligence Network. The Internet and our critical infrastructure are constantly under attack from viruses and other invasive programs. The President's Budget for 2003 requests $30 million to create the Cyberspace Warning Intelligence Network (CWIN) that would link the major players in government and the private sector to manage future cyberspace crises.

Priority Wireless Access. On September 11, we learned first hand that in times of a major crisis, wireless communication jams due to congestion. First responders must be able to complete calls in a timely manner. The President's Budget for 2003 requests $60 million to develop a wireless priority access program that will give authorized users priority on the cellular network. The program will ensure that first responders have priority for cellular phone coverage during emergencies.

National Infrastructure Simulation and Analysis Center. The President's Budget for 2003 requests $20 million to fund the National Infrastructure Simulation and Analysis Center at the Department of Energy. This Center will promote collaboration between Federal research efforts and the private sector to better understand the dependencies between the Internet, our critical infrastructure, and our economy.

Secure "GovNet" Feasibility Study. The President's Budget for 2003 requests $5 million for a feasibility study of a proposal to develop a government network that will secure critical functions performed by government at a higher level of security against external attack.

Advanced Encryption Standard. The President helped foster better computer security at Federal agencies. A new Federal standard announced on December 4, 2001, is designed to protect sensitive, unclassified information well into the 21st century. In limited circumstances, it will also be available for classified national security information. The new standard, called the Advanced Encryption Standard, also is expected to be used widely in the private sector, benefiting millions of consumers and businesses.

Cybercorps Scholarships for Service. The President's Budget for 2003 requests $11 million for the "Cybercorps." By injecting scholarship funding into universities across America, the Cybercorps Scholarship for Service program encourages college students to become high tech computer security professionals within government. Managed by the National Science Foundation and the Office of Personnel Management, this program also helps to build academic programs at universities in the area of computer security.

The government has aided the mobile business market with supporting pro-growth telecommunications policies by working with industry and local and state governments to assist with the development and deployment of new technologies and services. An example of this effort is, "On October 24, 2001, the Administration supported successful efforts to lift the wireless spectrum ownership limits, which constrained the wireless industry's ability to provide quality service." (Whitehouse)

On October 26, 2001, the President signed into law the USA Patriot Act. One area of this legislation focused on communications. "Federal criminal laws were updated to reflect the rapid and dramatic changes that have taken place in recent years in communications technology. For example, it improved law enforcement's ability to obtain stored voice mail and records from communications and computer-service providers, and amended the pen register/trap and trace statute to apply to Internet communications." (Securing the Homeland Strengthening the Nation)

The use of technology to aid government surveillance, such as Carnivore and Echelon, is a real concern to individual's privacy. Georgian Republican Bob Barr had been voicing a concern over the "invasive nature of legislation proposed and passed since September 11." (McCullagh) Barr states, "as the sphere of privacy shrinks ever smaller, the sphere of government power necessarily grows larger." (McCullagh)

The need for strong encryption is necessary for both businesses and individuals. Weak encryption can no longer be a reasonable excuse for insecure systems. "Internet pioneer David Reed recently pointed out that in the early years, efforts to incorporate end-to-end encryption

into the base standards of the Net were reportedly discouraged for reasons of national security." (Ozzie) In order for the m-business market to grow, government and industry need to explore new ways to secure systems. These systems need to allow businesses to conduct secure transactions while allowing government the ability to protect the interests and security of the nation. Strong encryption is a technology, and, a regulation and policy issue that needs to be implemented now to grow the m-business market and protect the rights of companies and individuals.

While the government is pushing legislation, industry is creating technologies to further advance security of data. There are currently more than 200 companies working on new technologies to make data tamper proof. Two examples are Microsoft's Palladium and Intel's LaGrande. Microsoft is advertising Palladium as a way for consumers to protect data and the entertainment industry to protect copyrighted content. Intel's LaGrande technology will create a "vault" where data can be stored and will work in conjunction with Microsoft's Palladium. This is a real concern that is being voiced by privacy organizations. "They worry that such industry controlled "protective" technologies will make it possible for corporations to snoop on computer users, and could lay a technological foundation for a Big Brother-like corporate/government alliance." (Jahnke) But today is a different environment than pre-911. Jahnke states,

> "Back in those pre-9/11 days, the initiative was easily batted down by privacy groups but now, some people fear, it's a different world. Today, as we celebrate the first anniversary of 9/11, concerns about security trump those about privacy, and any technology with the word "security" in it gets the majority vote."(Jahnke)

A balance is needed between security and privacy that will satisfy all parties. Governments need to be able to secure information of national importance while being able to monitor information of others to protect the nation. Businesses and individuals need security to protect transactions

and personal information while not giving up their rights to privacy. This is not a simple solution that will be resolved immediately, but one that will take time to find a compromise between all involved.

THE FUTURE

Companies looking to effectively and efficiently mobilize their workforce face many obstacles. Industry expert Douglas Neal of Mobile Automation states that there are three mobility challenges that businesses must address. They are security; lack of IT resources and the need to reduce help desk costs. (Stone)

With advancements in technology and industry groups trying to standardize, companies need to address the issues of why it is important to incorporate a mobile solution for their business operation. Businesses need to understand how the technology can satisfy the needs of the mobile user, whether an employee, supplier, partner or customer. David Rippetoe, Director of Business Development for Retrieval Dynamics Corporation (RDC), wrote a white paper titled "Mobile Data (M-DATA): Its Impact on Business Operations, Productivity and Response Times." In this white paper, Rippetoe suggests nine opportunities that the mobile user can use to their competitive advantage:

1. **Response Time:** M-data allows the mobile professional to quicken response time of documents and data to their customer. Instead of calling the home office to have someone put a document in a fax machine, the mobile professional can send it to the appropriate contact while in the car or in the customer's office. In some cases, especially with e-mail and fax, response times can be a matter of seconds instead of hours or days.

2. **Personalized Service:** In a majority of instances, the m-data user can work directly with the client to send the correct documentation to that client. As an example, a user wants to send a sales sheet to a client who wants to pass it along to one of their customers. The m-data user uses his/her Web-enabled pilot to e-mail the PDF file of the sales sheet in a matter of minutes. Another example is sending a personalized thank you letter to new business prospect seconds after leaving the customer's office. These types of personalized services enhance customer relationships and serve as a foundation to grow the business.

3. **Productivity:** Being stuck in traffic or away from the office is no excuse for not being productive any longer. M-data technology allows the mobile

professional to work anywhere, anytime, thus creating better productivity and more profitability.

4. **Lower Administrative Cost:** Cost efficiencies and economies of scale can be realized by utilizing m-data technology. Capital expenditures typically allocated for new support personnel could be reinvested else where in an organization. And existing back office support personnel can be utilized in other areas that can't be easily automated, thus improving the efficiencies and real dollar savings for the entire organization.

5. **Mobile Back Office Support:** Mobile professionals now have a tool to empower themselves to get things accomplished the way they prefer. Instead of having a back office support person distributing brochures or letters, the mobile professional can handle the allocation themselves and improve response time and customer relationships. This is especially true in an after-hours setting when no back office person is available.

6. **Location:** Using today's global wireless infrastructure, m-data users can send their documents from anywhere in the world to a contact anywhere in the world. While there are limits to acquiring wireless signals in certain portions of the world, the majority of civilized countries present sufficient systems for wireless activity.

7. **Access:** M-data can be accessed from a growing list of Web-enabled wireless devices. Examples include RIM and Motorola 2-way pagers, WAP phones, Palm OS devices, and the assorted Windows CE and Pocket PC devices.

8. **Tracking/Reporting:** When using m –data technology, users can access on-line reports to track document distribution dates, times and costs to ensure that items were distributed as directed. This function of the m-data process can provide immediate peace of mind, unlike in some instances where a user is not sure if a back office person followed through on a request on time.

9. **Ease of Use:** When an application is easy to use, the user is more apt to keep using the application. This summation is at the heart of the m-data system. Using any Web-enabled device, not in hours (or days) as in traditional printing and fulfillment models. (Rippetoe)

The future looks promising for the U.S. m-business market based on a survey conducted by ComScore Media Metrix. "Nearly 10 million active Internet users in the United States check e-mail or surf the Web for news or local services via mobile phones and handheld computers." (Reuters) In percentage terms, this represents 11 percent of the U.S. wireless users who access

the Internet through a wireless device. While the majority is only using it for checking email or surfing the Web, the data from the survey proves that there is already a significant wireless Web audience. This number of users will provide a good base for businesses to build a viable m-business market.

CONCLUSION

The U.S. m-business market is still an infant market due to the lack of standards, no real applications available for businesses and the lack of strong encryption. The lack of standards will continue to be an issue, as proponents will continue to push the technology they consider to be the best. One way around the standards issue would be for the equipment manufacturers to provide equipment that is not technology specific but able to function with multiple networks, software and applications. Until applications that provide real value to businesses enter the market, messaging and email will be the major uses of the m-business market. Security and privacy will continue to be an issue and might be the largest hurdle to overcome as the market enters the post-911 era. Being able to provide a secure transaction for business and consumers is a vital factor in the users accepting that wireless transfers will be secure, with little concern about infringements on their privacy. Until these issues are resolved or there are viable solutions, the U.S. m-business market will continue to be a slow growth market for the near future.

GLOSSARY

10BaseT
An IEEE standard (802.3) for operating 10 Mbps Ethernet networks (LANs) with twisted pair cabling and a wiring hub.
http://www.wi-fi.org/glossary.asp

3G
3G is an ITU specification for the third generation (analog cellular was the first generation, digital PCS the second) of mobile communications technology. 3G promises increased bandwidth, up to 384 Kbps when a device is stationary or moving at pedestrian speed, 128 Kbps in a car, and 2 Mbps in fixed applications. 3G will work over wireless air interfaces such as GSM, TDMA, and CDMA. The new EDGE air interface has been developed specifically to meet the bandwidth needs of 3G.
http://80211-planet.webopedia.com/TERM/3/3G.html

AP (Access Point)
A hardware device, or software used in conjunction with a computer, that serves as a communications "hub" for wireless clients and provides a connection to a wired LAN. An AP can double the range of wireless clients and provide enhanced security.
http://www.wi-fi.org/glossary.asp

Bluetooth
Bluetooth refers to a short-range radio technology aimed at simplifying communications among Net devices and between devices and the Internet. It also aims to simplify data synchronization between Net devices and other computers.

Products with Bluetooth technology must be qualified and pass interoperability testing by the Bluetooth Special Interest Group prior to release.

The Bluetooth 1.0 specification consists of two documents: the Foundation Core, which provides design specifications, and the Foundation Profile, which provides interoperability guidelines.

Bluetooth's founding members include Ericsson, IBM, Intel, Nokia and Toshiba.

http://80211-planet.webopedia.com/TERM/b/bluetooth.html

CARNIVORE

Carnivore is the Internet surveillance system developed by the U.S. Federal Bureau of Investigation (FBI), who developed it to monitor the electronic transmissions of criminal suspects.
http://searchsecurity.techtarget.com/sDefinition/0,,sid14_gci508347,00.html

CDMA

Short for ***Code-Division Multiple Access,*** a digital cellular technology that uses *spread-spectrum* techniques. Unlike competing systems, such as GSM, that use *TDMA*, CDMA does not assign a specific frequency to each user. Instead, every channel uses the full available spectrum. Individual conversations are encoded with a pseudo-random digital sequence.

CDMA is a military technology first used during World War II by the English allies to foil German attempts at jamming transmissions. The allies decided to transmit over several frequencies, instead of one, making it difficult for the Germans to pick up the complete signal.

Because Qualcomm Inc. created communications chips for CDMA technology, it was privy to the classified information. Once the information became public, Qualcomm claimed patents on the technology and became the first to commercialize it.

http://80211-planet.webopedia.com/TERM/c/CDMA.html

ECHELON

Echelon is an officially unacknowledged U.S.-led global spy network that operates an automated system for the interception and relay of electronic communications. Monitored transmissions are said to include up to 3 billion communications daily, including all the telephone calls, e-mail messages, faxes, satellite transmissions, and Internet downloads of both public and private organizations and citizens worldwide. Led by the U.S. National Security Agency (NSA), Echelon is operated collaboratively by the intelligence agencies of the United States, the United Kingdom, Australia, Canada, and New Zealand. The organization's name originated as the code name for the system component responsible for intercepting satellite communications.

http://searchsecurity.techtarget.com/sDefinition/0,,sid14_gci560967,00.html

GPRS

Short for ***General Packet Radio Service***, a standard for wireless communications which runs at speeds up to 115 kilobits per second, compared with current GSM (Global System for Mobile Communications) systems' 9.6 kilobits.

GPRS, which supports a wide range of bandwidths, is an efficient use of limited bandwidth and is particularly suited for sending and receiving small bursts of data, such as e-mail and Web browsing, as well as large volumes of data.

http://80211-planet.webopedia.com/TERM/g/GPRS.html

GSM

Short for ***Global System for Mobile Communications,*** one of the leading digital cellular systems. GSM uses narrowband TDMA, which allows eight simultaneous calls on the same radio frequency.

GSM was first introduced in 1991. As of the end of 1997, GSM service was available in more than 100 countries and has become the *de facto* standard in Europe and Asia.

http://80211-planet.webopedia.com/TERM/G/GSM.html

802.11

802.11 refers to a family of specifications developed by the IEEE for wireless LAN technology. 802.11 specifies an over-the-air interface between a wireless client and a base station or between two wireless clients. The IEEE accepted the specification in 1997.

There are several specifications in the 802.11 family:

- **802.11** -- applies to wireless LANs and provides 1 or 2 Mbps transmission in the 2.4 GHz band using either frequency hopping spread spectrum (FHSS) or direct sequence spread spectrum (DSSS).
- **802.11a** -- an extension to 802.11 that applies to wireless LANs and provides up to 54 Mbps in the 5GHz band. 802.11a uses an orthogonal frequency division multiplexing encoding scheme rather than FHSS or DSSS.
- **802.11b** (also referred to as *802.11 High Rate* or *Wi-Fi*) -- an extension to 802.11 that applies to wireless LANS and provides 11 Mbps transmission (with a fallback to 5.5, 2 and 1 Mbps) in the 2.4 GHz band. 802.11b uses only DSSS. 802.11b was a 1999 ratification to the original 802.11 standard, allowing wireless functionality comparable to Ethernet.
- **802.11g** -- applies to wireless LANs and provides 20+ Mbps in the 2.4 GHz band.

http://80211-planet.webopedia.com/TERM/8/802_11.html

J2ME

Short for ***Java 2 Platform Micro Edition***. J2ME is Sun Microsystems' answer to a consumer wireless device platform. J2ME allows developers to use Java and the J2ME wireless toolkit to create applications and programs for wireless and mobile devices.

J2ME consists of two elements -- **configurations** and **profiles**.

Configurations provide a set of libraries and a virtual machine for a category of wireless device. There are two configurations for J2ME, one for fixed wireless devices and one for mobile wireless devices.

Profiles are APIs built on top of configurations to provide a runtime environment for a specific device, such as a PDA, cellphone, or set-top box. The profile manages the application, user interface, networking and I/O.

In order to support Java apps, manufacturers need to implement a profile for their specific devices.

http://80211-planet.webopedia.com/TERM/J/J2ME.html

PDA

Short for ***personal digital assistant,*** a handheld device that combines computing, telephone/fax, and networking features. A typical PDA can function as a cellular phone, fax sender, and personal organizer. Unlike portable computers, most PDAs began as pen-based, using a stylus rather than a keyboard for input. This means that they also incorporated handwriting recognition features. Some PDAs can also react to voice input by using voice recognition technologies. PDAs of today are available in either a stylus or keyboard version.

The field of PDA was pioneered by Apple Computer, which introduced the Newton MessagePad in 1993. Shortly thereafter, several other manufacturers offered similar products. Today, one of the most popular brands of PDAs is the series of Palm Pilots from Palm, Inc.

PDAs are also called palmtops, hand-held computers and *pocket computers.*

http://80211-planet.webopedia.com/TERM/p/PDA.html

Roaming

In wireless networking, *roaming* refers to the ability to move from one AP coverage area to another without interruption in service or loss in connectivity

http://80211-planet.webopedia.com/TERM/r/roaming.html

Short Message Service SMS

Short Message Service (SMS) is the transmission of short text messages to and from a mobile phone, fax machine and/or IP address. Messages must be no longer than 160 alpha-numeric characters and contain no images or graphics.

Once a message is sent, it is received by a Short Message Service Center (SMSC), which must then get it to the appropriate mobile device.

To do this, the SMSC sends a SMS Request to the home location register (HLR) to find the roaming customer. Once the HLR receives the request, it will respond to the SMSC with the subscriber's status: 1) inactive or active 2) where subscriber is roaming.

If the response is "inactive", then the SMSC will hold onto the message for a period of time. When the subscriber accesses his device, the HLR sends a SMS Notification to the SMSC, and the SMSC will attempt delivery.

The SMSC transfers the message in a Short Message Delivery Point to Point format to the serving system. The system pages the device, and if it responds, the message gets delivered.

The SMSC receives verification that the message was received by the end user, then categorizes the message as "sent" and will not attempt to send again.

The number of mobile-phone users expects to reach 500 million worldwide by 2003, and with the help of SMS, 75 percent of all cellular phones will be Internet-enabled.

http://80211-planet.webopedia.com/TERM/s/Short_Message_Service.html

TDMA

Short for ***Time Division Multiple Access,*** a technology for delivering digital wireless service using time-division multiplexing (TDM). TDMA works by dividing a radio frequency into time slots and then allocating slots to multiple calls. In this way, a single frequency can support multiple, simultaneous data channels. TDMA is used by the GSM digital cellular system.

http://80211-planet.webopedia.com/TERM/t/TDMA.html

Text Messaging

Sending short text messages to a device such as a cellular phone, PDA or pager. Text messaging is used for messages that are no longer than a few hundred characters. The term is usually applied to messaging that takes place between two or more mobile devices.

http://80211-planet.webopedia.com/TERM/t/text_messaging.html

WAP

Short for the ***Wireless Application Protocol***, a secure specification that allows users to access information instantly via handheld wireless devices such as mobile phones, pagers, two-way radios, smartphones and communicators.

WAP supports most wireless networks. These include CDPD, CDMA, GSM, PDC, PHS, TDMA, FLEX, ReFLEX, iDEN, TETRA, DECT, DataTAC, and Mobitex.

WAP is supported by all operating systems. Ones specifically engineered for handheld devices include PalmOS, EPOC, Windows CE, FLEXOS, OS/9, and JavaOS.

WAPs that use displays and access the Internet run what are called microbrowsers--browsers with small file sizes that can accommodate the low memory constraints of handheld devices and the low-bandwidth constraints of a wireless-handheld network.

Although WAP supports HTML and XML, the WML language (an XML application) is specifically devised for small screens and one-hand navigation without a keyboard. WML is scalable from two-line text displays up through graphic screens found on items such as smart phones and communicators. WAP also supports WMLScript. It is similar to JavaScript, but makes minimal demands on memory and CPU power because it does not contain many of the unnecessary functions found in other scripting languages.

Because WAP is fairly new, it is not a formal standard yet. It is still an initiative that was started by Unwired Planet, Motorola, Nokia, and Ericsson.

http://80211-planet.webopedia.com/TERM/W/WAP.html

WEP

Wired Equivalent Privacy (WEP) is a security protocol, specified in the IEEE Wireless Fidelity (Wi-Fi) standard, 802.11b, that is designed to provide a wireless local area network (WLAN) with a level of security and privacy comparable to what is usually expected of a wired LAN.

http://searchsecurity.techtarget.com/sDefinition/0,,sid14_gci549087,00.html

WECA

WECA (Wireless Ethernet Compatibility Alliance) was recently formed to provide compliance and standards for the wireless LAN industry. They have announced the Wi-Fi™ (wireless fidelity) standard that is an awarded "seal of approval" for those WLAN products that have successfully completed prescribed interoperability testing. The Wi-Fi™ seal will provide customers the assurance that products bearing this logo will work together. The WECA Group includes a growing number of the industry's leading wireless LAN manufacturers.
http://www.weca.net/downloads/weca80211boverview.pdf

Wi-Fi

Wi-Fi is short for ***wireless fidelity*** and is another name for IEEE 802.11b. It is a trade term promulgated by the Wireless Ethernet Compatibility Alliance (WECA). "Wi-Fi" is used in place of 802.11b in the same way that "Ethernet" is used in place of IEEE 802.3. Products certified as Wi-Fi by WECA are interoperable with each other even if they are from different manufacturers. A user with a Wi-Fi product can use any brand of access point with any other brand of client hardware that is built to the Wi-Fi standard.

http://80211-planet.webopedia.com/TERM/w/Wi_Fi.html

WLAN

Acronym for ***wireless local-area network***. Also referred to as *LAWN*. A type of local-area network that uses high-frequency radio waves rather than wires to communicate between nodes.

http://80211-planet.webopedia.com/TERM/w/WLAN.html

APPENDIX A - SYNCHROLOGIC SURVEY – 2002 HANDHELD SURVEY

Synchrologic recently conducted a 2002 Handheld Trends survey to help our newsletter readers understand what other IT managers are thinking about handheld computing. The web-based survey drew 156 responses from IT managers in a variety of industries. We appreciate the respondents taking the time to complete the survey, and are happy to present the results below.

The raw results follow our high level analysis of the results.

Within a year the majority of handhelds will be centrally managed. As handheld devices are becoming more prevalent, an increasing number of IT organizations are moving or being forced to move towards centralized support. Over 70% of the respondents expected to centrally purchase and manage handhelds within 18 months, with just over 40% already there. As expected, we saw that Pocket PC has made big headway in garnering market share from Palm in the enterprise.

Mobilizing enterprise applications is starting to gain momentum. While just under 10% of the respondents have already mobilized their enterprise applications to handheld devices, 50% plan to do so within the next 18 months.

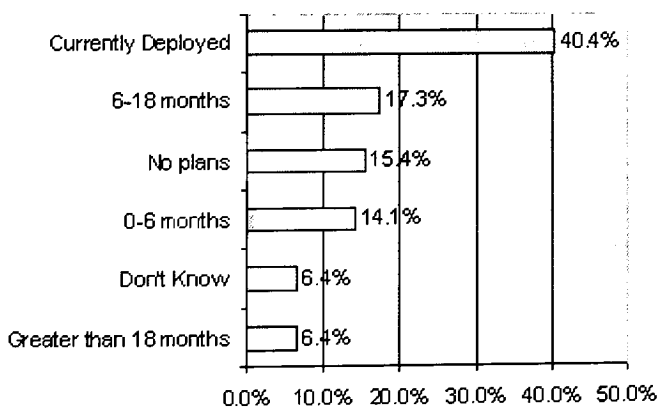
Email is the most likely application to be mobilized. Email and PIM data are often the first application to be mobilized, emphasizing the key role Email plays in both internal and external business communication.

Wireless is the preferred method of connectivity, despite the challenges. Wireless connectivity options were very much preferred compared to wireline modems. Apparently the convenience outweighs concerns about costs, coverage, standards, and bandwidth.

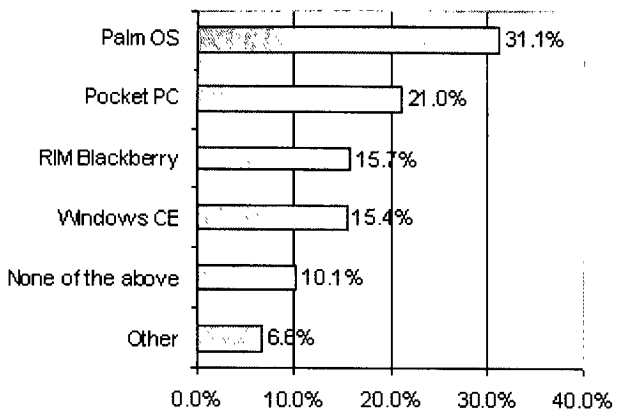
"Unexpected" business drivers are pushing companies to mobilize. We expected in the current economic environment that most projects would be justified by a formal ROI analysis. But it appears that the ability to build competitive advantage and provide heightened levels of customer service is strong enough justification for many firms currently going mobile.

Survey Questions And Answers

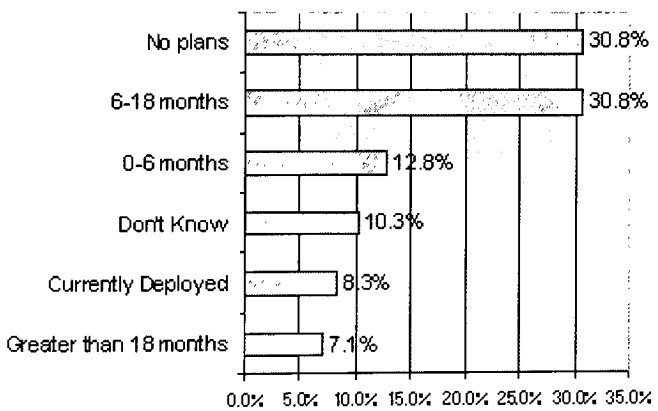
1. What is your organization's time frame for centrally managing and purchasing handheld mobile devices such as Pocket PC and Palm OS devices?



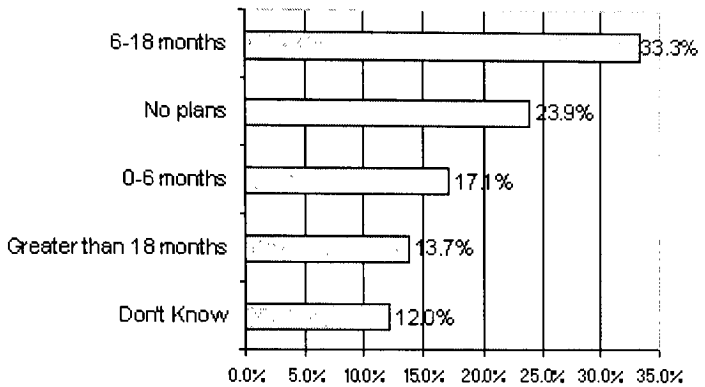
2. What types of handheld mobile devices are currently supported in your organization?



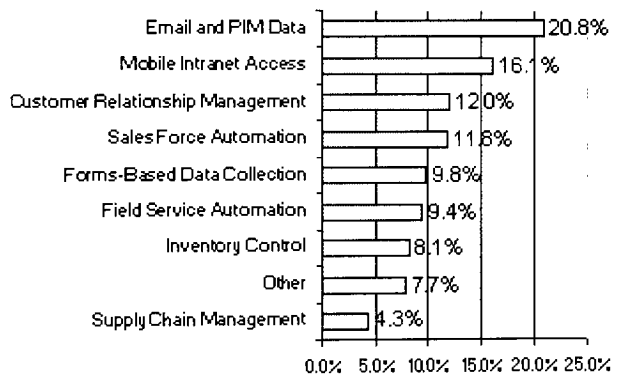
3. What is your organization's time frame for mobilizing enterprise applications such as CRM, ERP, and SCM to handhelds?



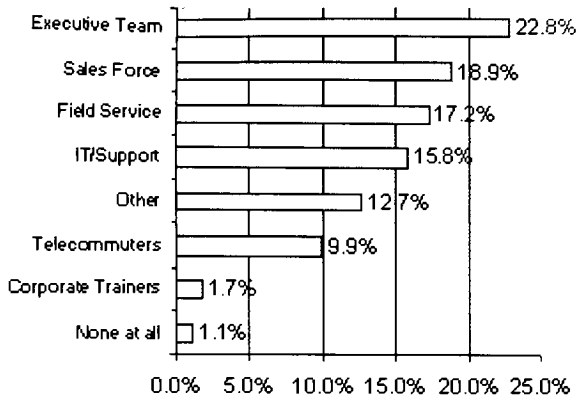
4. What is the time frame for allocating spending on mobilizing enterprise applications to handhelds?



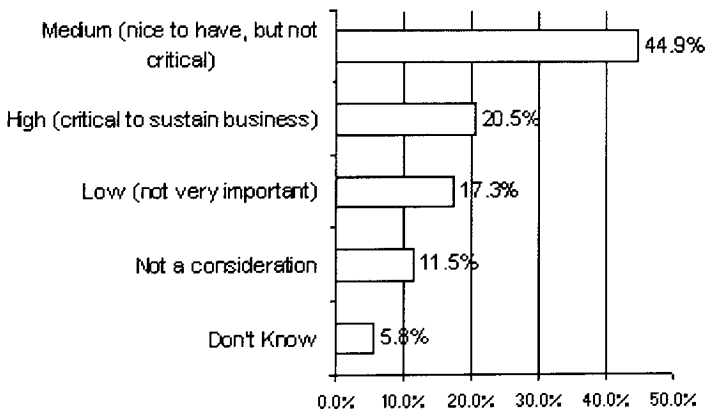
5. What types of enterprise applications would your organization likely mobilize to handheld devices?



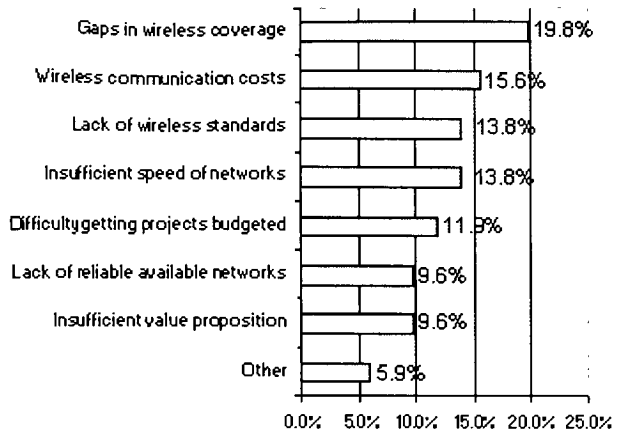
6. Who will be the primary users of handheld technologies?



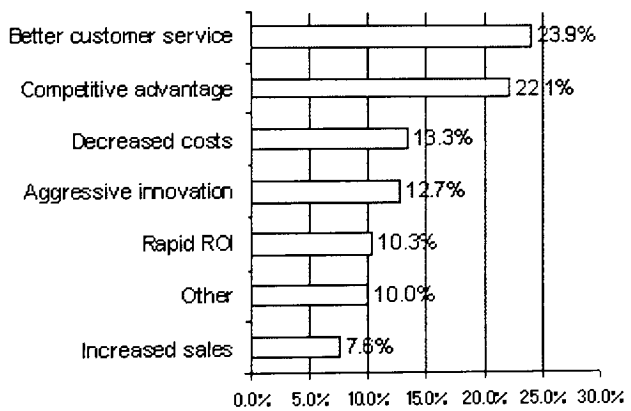
7. What is the level of priority placed on investment in extending existing system to handheld devices?



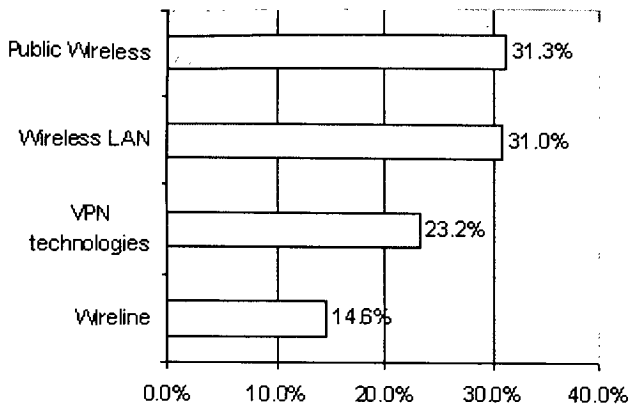
8. Which of the following do you see as roadblocks to successful wireless handheld projects in your organization?



9. What are the key business drivers that have lead your organization to deploy or plan deployment of handheld devices?



10. Which types of mobile connectivity options will your organization support for handhelds?



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